

**TECHNICAL MANUAL  
OPERATOR'S MANUAL**

**MULTIPLE INTEGRATED LASER  
ENGAGEMENT SYSTEM  
(MILES 2000)**

**TACTICAL ENGAGEMENT SIMULATION SYSTEM (TESS)**

**FOR**

**LIGHT ARMORED VEHICLE  
(LAV-25)**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or you know of a way to improve the procedures, please let us know. Mail your letter, DA FORM 2028 (Recommended Changes to Publications and Blank Forms), or DA FORM 2028-2 located in back of this manual directly to Commander, Simulation, Training, and Instrumentation Command (STRICOM): ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. Marine Corps users submit NAVMC 10772 to: Commander, Marine Corps Logistics Base (Code 826), 814 Radford Boulevard, Albany, GA 31704-1128.

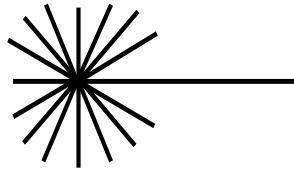
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**UNITED STATES MARINE CORPS**

**27 MAY 2002**



**LASER WARNING**

Suitable precautions must be taken to avoid possible damage to the eye from overexposure to radiated laser energy. Precautionary measures include the following:

- **NEVER fire the laser** at personnel within 10 meters.
- **NEVER look at the laser transmitter** through magnifying optics such as binoculars, telescopes, or periscopes at ranges less than 40 meters.

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## SAFETY SUMMARY

### WARNING

- To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.
- Never touch the vehicle exhaust equipment when installing or removing MILES 2000 equipment. The exhaust can be very hot and cause severe burns.

### FIRE/EXPLOSION WARNING

- Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well ventilated areas. Do not permit smoking in the area. Injury to personnel may result.

### CAUTION

- Use care when starting capscrews not to cross threads. DO NOT use any tools to tighten capscrews until directed.
- To avoid damaging the Detector Belts on the LAV-25, place the belt 2 inches away from the rear edge of the sliding mantle plate.
- Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.
- Any batteries or otherwise hazardous materials replaced as routine maintenance should be disposed of in accordance with local procedure.

For information on **FIRST AID**, refer to **FM 21-11/MCRP-3-02G**.

## HOW TO USE THIS MANUAL

### **INTRODUCTION.**

This manual contains operation instructions for the Multiple Integrated Laser Engagement System (MILES 2000), Tactical Engagement Simulation System (TESS) when configured on the Light Armored Vehicles (LAVs).

### **MANUAL DESCRIPTION.**

This manual is divided into three chapters. Chapters are further divided into sections. The chapter descriptions are provided in the following subparagraphs:

Chapter 1 is an introduction that provides general information, equipment description and data, and theory of operation.

Chapter 2 provides operating instructions.

Chapter 3 provides operating maintenance instructions.

## **CHAPTER 1 INTRODUCTION**

### **SECTION I. GENERAL INFORMATION**

#### **1.1 SCOPE.**

This manual describes how to install, operate, and maintain the Multiple Integrated Laser Engagement System (MILES 2000) Tactical Engagement Simulation System (TESS) when configured on the Light Armored Vehicles (LAVs). The manual also explains all authorized operator maintenance. Refer any maintenance problems not covered to organizational maintenance personnel.

#### **1.2 MAINTENANCE FORMS AND RECORDS.**

Department of the Army forms and procedures used for equipment maintenance will be those described by DA PAM 738-750, The Army Maintenance Management System (TAMMS). Marine Corps personnel will use TM 4700-15/ \_\_, Equipment Record Procedures, and refer to the on-line MCPDS or Marine Corps Stocklist SL-1-2, Index of Technical Publications.

#### **1.3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).**

If your MILES 2000 equipment for the LAV system needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a Quality Deficiency Report. Mail to us at Commander, Simulation, Training, and Instrumentation Command (STRICOM), ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. We'll send you a reply. For U.S. Marine Corps personnel, submit SF-368 in accordance with MCO 4855.10 (Quality Deficiency Report) to: Commander, Marine Corps Logistics Base (Code G316-1), 814 Radford Boulevard, Albany, GA 31704-1128.

#### **1.4 CORROSION PREVENTION AND CONTROL.**

- a. Corrosion Prevention and Control (CPC) of material is a continuing concern. It is important that any corrosion problems with this item be reported, so the problem can be corrected and improvements can be made to prevent the problem in the future.
- b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.
- c. If a corrosion problem is identified, it can be reported using form SF-368. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem.
- d. The form should be submitted to Commander, Simulation, Training, and Instrumentation Command (STRICOM), ATTN: AMSTI-OPS-L; 12350 Research Parkway, Orlando, FL 32826-3276. U.S. Marine Corps personnel, submit SF-368 in accordance with MCO 4855.10 (Quality Deficiency Report).

#### **1.5 PREPARATION FOR STORAGE OR SHIPMENT.**

When receiving equipment for storage or shipment, always inspect the returned equipment for damage, breaks, cracks, and cleanliness.

## **1.6 LIST OF ABBREVIATIONS AND GLOSSARY.**

Refer to Table 1-1 for a list of abbreviations used with the MILES 2000 System, and refer to Table 1-2 for the glossary.

**Table 1-1. List of Abbreviations.**

AAV	Assault Amphibious Vehicle
AC-DC	Alternating Current/Direct Current
ASAAF	Automatic Small Arms Alignment Fixture
ATWESS	Anti-Tank Weapons Effects Signature Simulator
AVCPS	Audio Visual Cue Pyrotechnic Simulator
BFA	Blank Firing Adapter
BIT	Built-In-Test
CD/TDTD (Controller Gun)	Controller Device/Training Data Transfer Device
CDA	Control Display Assembly
CPC	Corrosion Prevention and Control
CSWS	Crew Served Weapon System
CU	Control Unit
CVC	Combat Vehicle Crew
CVS	Combat Vehicle System
DC-DC	Direct Current/Direct Current
DPCU	Data Processing Control Unit
EIR	Equipment Improvement Recommendation
EOD	Explosive Ordnance Disposal
FCU	Fire Control Unit
FlashWESS	Flash Weapons Effects Signature Simulator
FU	Firing Unit
ID	Identification
I/O	Input/Output
IR	Infrared
ISU	Integrated Sight Unit
ITS	Independent Target System
IWS	Individual Weapons System
IWS Console (DPCU)	Individual Weapons System Console (Data Processing Control Unit)

**Table 1-1. List of Abbreviations - Continued.**

KSI	Kill Status Indicator
LAV	Light Armored Vehicle
LASER	Light Amplification by Stimulated Emission of Radiation
LED	Light Emitting Diode
LTU	Laser Transmitter Unit
LU	Loader Unit
MARS	MILES After-Action Review System
MCS	Master Control Station
MG	Machine Gun
MGS	Missile Guidance System
MGSS	Main Gun Signature Simulator
MILES	Multiple Integrated Laser Engagement System
mm	millimeters
O/C	Observer/Controller
OTPD	Optical Turret Positioning Device
PDA	Power Distribution Assembly
PID	Player Identification
Pk	Probability of Kill
PMCS	Preventive Maintenance Checks and Services
PROM	Programmable Read-Only Memory
SAT	Small Arms Transmitter
SMAW	Shoulder-Mounted Assault Weapon
SWS	Surrogate Weapons System
TAMMS	The Army Maintenance Management System
TESS	Tactical Engagement Simulation System
TNB	Turret Network Box
TOW	Tube-Launched Optically-Tracked Wire-Guided Weapon System
ULT	Universal Laser Transmitter
V	Volt
Vac	Volts Alternating Current
Vdc	Volts Direct Current

**Table 1-2. Glossary.**

Administrative Kill	A kill initiated by the CD/TDTD (Controller Gun) for administrative purposes.
Automatic Small Arms Alignment Fixture (ASAAF)	Device used to align the Small Arms Transmitter (SAT) to the sights on a weapon.
Catastrophic Kill	A kill that totally disables a vehicle or individual.
Cheat Kill	A kill is assessed to a system when a tamper attempt has been detected.
Commo Kill	A kill that disables external communications.
Controller	An umpire or referee in a MILES 2000 training exercise.
Controller Device (CD/TDTD) (Controller Gun)	A device used by the Controller to upload, download and test the MILES 2000 system.
Fastener Tape	A hook and pile type tape used to hold vehicle detector belts and other MILES 2000 equipment in place.
Firepower Kill	A kill that disables vehicle weapons.
Helmet Harness	The part of the IWS attached to the helmet or soft cover.
Hit	Simulated contact with incoming fire that does not result in a Kill.
Individual Weapons System (IWS)	The Helmet and Torso Harness assemblies and IWS Console (DPCU), which is worn by personnel. This equipment also includes the Small Arms Transmitter (SAT).
Kill	Refer to Catastrophic Kill, Commo Kill, Firepower Kill, or Mobility Kill
Kill Status Indicator (KSI)	A device attached to a vehicle that produces an external flashing light indicating a Hit, Near Miss or Kill.
LASER	Light Amplification by Simulated Emission of Radiation. A narrow beam of light capable of transmitting information.
Laser Beam	In MILES 2000 equipment, an eye-safe, invisible beam of light that simulates weapons fire.
Laser Detector	A device that senses incoming laser beams.
Laser Transmitter	A device that transmits a laser beam.
Main Gun Signature Simulator (MGSS)	A device that produces a flash and bang to simulate main gun firing.
Mobility Kill	A kill that disables the vehicle movement. The crew has 20 seconds to bring the vehicle to a stop. If motion is sensed after the 20 seconds, a Cheat Kill will occur.
Near Miss	Laser fire close enough to be sensed by a laser detector, but not close enough to cause a Hit or Kill.

**Table 1-2. Glossary - Continued.**

Optical Turret Positioning Device (OTPD)	A device that provides an optical reference signal to the turret detector belts (on applicable vehicles) to determine the turret position with reference to the hull.
Reset	Brings the system to the ready (alive) condition. In a CVS, the reset brings the system to a ready condition and returns ammunition to the default levels.
Resurrect	When a CVS is resurrected, the system is brought to a ready condition, but the ammunition levels remain as they were when the system was killed.
Small Arms Transmitter (SAT)	A laser transmitter used on various individual and vehicle-mounted rifles and machine guns.
Torso Harness	The part of the IWS that is worn on the upper body.
Universal Laser Transmitter (ULT)	A laser transmitter used on various combat vehicle systems mounted on the main gun and the coax machine gun.
Weapon Token	Is embedded in software and allows the IWS Console (DPCU) to enable a SAT. The Weapon Token is transmitted to the IWS when the system is reset/resurrected by the CD/TDTD (Controller Gun). The SAT cannot be enabled without a Weapon Token and will not have one in the following conditions: system is killed or another SAT is enabled with the same Torso Harness.

**NOTE**

Vehicle kits contain the SATs for the vehicle mounted weapons, but do not include IWS SATs. IWS equipment is issued separately.

**1.7 SAFETY, CARE, AND HANDLING.**

Before, during and after operation of equipment, read and adhere to all applicable WARNINGS and CAUTIONS. Perform all preventive maintenance checks and services as scheduled, and report any discrepancies as soon as possible. Use the proper tools and procedures for installation, troubleshooting, removal and replacement of components, and notify higher echelon maintenance personnel when warranted.

Although MILES 2000 consists of ruggedized equipment designed to withstand extreme vibration, shock, and environmental stresses, treat the equipment with reasonable care. Do not use excessive force when handling, packing, or stowing equipment. Responsible handling and use will help prolong the life cycle and appearance of the equipment.

## SECTION II. EQUIPMENT DESCRIPTION AND DATA

### **1.8 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.**

**1.8.1 Equipment Characteristics.** The MILES 2000 LAV system permits the vehicle and crew to take part in realistic combat training exercises. Actual firing conditions of all vehicle weapons are simulated using laser beams. Blank ammunition, and Anti-Tank Weapons Effects Signature Simulator (ATWESS)/Flash Weapons Effects Signature Simulator (FlashWESS) add to the system's realism.

Laser detectors mounted on the LAV sense incoming fire. The MILES 2000 system electronics determine the accuracy and simulated damage of incoming fire. The system also detects the type of weapon directing fire against the LAV.

#### **1.8.2 Capabilities and Features.**

- a. Easily installed and removed.
- b. Simulates firing capabilities of the 25 mm main gun, the pintle-mounted M240E1 machine gun, and the M240 coax machine gun.
- c. Blank fire, ATWESS pyrotechnics charges, if used, and FlashWESS add realism to weapon use.
- d. Normal firing procedures used for all weapons.
- e. Detects all incoming fire, identifies incoming weapons and Player Identification (PID), and determines the effect of incoming fire on the using vehicle.
- f. Uses eye-safe laser transmitters.
- g. High visibility Kill Status Indicator (KSI) strobe light signals vehicle Near Miss, Hit, or Kill.
- h. Compatible with all other MILES devices.

### **1.9 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.**

#### **NOTE**

MILES equipment installation procedures should be followed as outlined in the technical manual. If the following procedures CANNOT be followed due to cable length or additional vehicle equipment, then place the MILES equipment in the best and safest location.

The MILES 2000 for the LAV systems contains the following equipment:

- a. M240 Small Arms Transmitter (SAT). Adaptation for the specific weapon is through a factory set laser power adjustment modifying the encoded personality Programmable Read-Only Memory (PROM), and attaching the weapon specific mounting adapter. The laser power is factory adjusted to represent the specific weapon type and simulate its firing capabilities. A window for the infrared link transmitter and receiver, and a sunlight readable firing indicator is located in the rear cover. The SAT is powered by an internal 3.6-volt lithium battery with a 3-year battery life. The M240 SAT mounts on the pintle-mounted machine gun barrel.



- b. Vehicle Detector Belts and Amplifier. Two (2) vehicle detector belts provide detection coverage for each aspect of the vehicle's vulnerability zones. The detector belts for the LAV-25 are installed on the turret.
- c. Kill Status Indicator (KSI). The KSI is an integrated status indicator that provides information to an attacking vehicle. The KSI is composed of two (2) major functional elements: a visual strobe and the decoder/interface electronics. The KSI also includes the interface inputs for the serial bus interface, and the optical input/output (I/O) port. The optical I/O port provides the optical interface to the Controller Device/Training Data Transfer Device (CD/TDTD) (Controller Gun) for transfer of vehicle types/Probability of Kill (Pk) data uploading and events downloading. The KSI also includes a motion sensor to detect vehicle motion after a Mobility Kill to allow the Control Unit (CU) to assess a Cheat Kill if motion occurs after 20 seconds.
- d. Universal Laser Transmitter (ULT). The ULT is a laser transmitter for use on the 25 mm main gun and coax machine gun. The ULT is mounted on the LAV-25. The transmitter has adjustable laser power which is factory set to a level representative of the weapon being simulated. The assembly is mounted to an adapter which in turn is mounted on the barrel of the 25 mm main gun. A FlashWESS is part of the ULT. The FlashWESS provides a realistic weapons signature consisting of muzzle flash.
- e. Coax Microphone. The Coax Microphone picks up the sound of blank fire and machine gun trigger, which causes the ULT on the main gun to fire. The Coax Microphone is mounted on the gas tube under the coax machine gun barrel.
- f. Control Unit (CU). The CU contains all primary user interface functions, displays, and controls. Weapon selection, ammo selection, loading/reloading of ammunition, and weapon status are functions provided by the CU. The CU monitors and automatically adjusts to the selected ammunition type, and monitors the rate of fire selection. The location of the unit is determined by the specific configuration of the vehicle to which it is mounted.
- g. Power Controller. The Power Controller provides 24 Volts direct current (Vdc), the charging voltage for the internal lead acid batteries, as well as power to the MILES 2000 system. The 24-volt (V) battery is converted to 10.5 Vdc output by a direct current/direct current (DC-DC) converter for use by the MILES 2000 kit, and provides backup power for more than 100 hours. The battery also supplies power to the KSI for a 10-minute time period in the event the vehicle's power is turned off and the vehicle is killed. The location of the Power Controller is determined by the specific configuration of the vehicle to which it is mounted.
- h. Optical Turret Positioning Device (OTPD). The OTPD transmits a MILES code and unique PID to the detector belts on the vehicle to determine turret position with reference to the hull. The OTPD is powered by a 9-volt battery and is mounted on the LAV-25.

**1.10 EQUIPMENT DATA.**

Table 1-3 defines the equipment data.

**Table 1-3. Equipment Data.**

<b>EQUIPMENT</b>	<b>WEIGHT (POUNDS)</b>	<b>DIMENSIONS L x W x D (INCHES)</b>	<b>STANDARD KILL RANGE (METERS)</b>
25 mm/Coax Machine Gun ULT, LAV-25	7.7	14.8 x 4.3 x 3.5	3000/800
M240 machine gun (SAT)	0.4	1.3 x 1.9 x 2.8	800
Left/Front belt, LAV-25	3.2	179 x 2.0	10
Right/Rear belt, LAV-25	3.2	153 x 2.0	10
Kill Status Indicator (KSI)	5.5	8.5 x 8.2 x 2.5	
Control Unit (CU)	0.97	4.5 x 4.0 x 2.0	
Power Controller	7.9	6.1 x 5.9 x 3.0	
Optical Turret Positioning Device (OTPD), LAV-25	1.0	2.0 x 6.3 (dia)	

## SECTION III. THEORY OF OPERATION

### **1.11 BASIC PRINCIPLES OF OPERATION.**

**1.11.1 Principles of Operation (MILES 2000).** The MILES 2000 system uses laser beams to simulate actual weapons fire. An eye-safe invisible laser beam is sent out by each weapon's transmitter when it is fired. The laser beam is coded and simulates all of the weapon's capabilities including range, accuracy, and destructive capability.

Laser detector systems are used to sense incoming fire. The detector systems register incoming laser beams and determine whether they have scored a Near Miss, Hit, or Kill. Incoming fire can result in more than one type of a Hit or Kill. Types of hits or kills include Mobility, Communications, Firepower, or a Catastrophic Kill of the entire vehicle.

Table 1-4 defines the Kill Indication Chart.

**1.11.2 Principles of Operation (LAVs).** All weapons on the LAVs are equipped with laser transmitters that are fired using normal weapon operating procedures. The LAV-25 has detector belts attached to its turret. A Control Unit (CU) mounted inside determines the extent of incoming fire and its effect. The Kill Status Indicator (KSI) is activated when incoming fire is detected. (See Figure 1-1.)

**1.11.2.1 25 mm Main Gun.** The main gun is fired using normal procedures. A strobe light located in the Universal Laser Transmitter (ULT) is used to add realism to the main gun fire. When the trigger is operated, both the strobe light and the ULT mounted on the 25mm gun, are fired together. The MILES 2000 system allows a basic load of rounds for the 25 mm gun.

**1.11.2.2 M240 Coax Machine Gun.** The M240 coaxial machine gun is fired using normal procedures. The gun is fitted with a Blank Firing Adapter (BFA) and loaded with blank ammunition. The sound of blank fire and the machine gun trigger is sensed by a microphone that triggers the ULT on the main gun barrel. The laser transmitter will operate as long as blank ammunition is being fired.

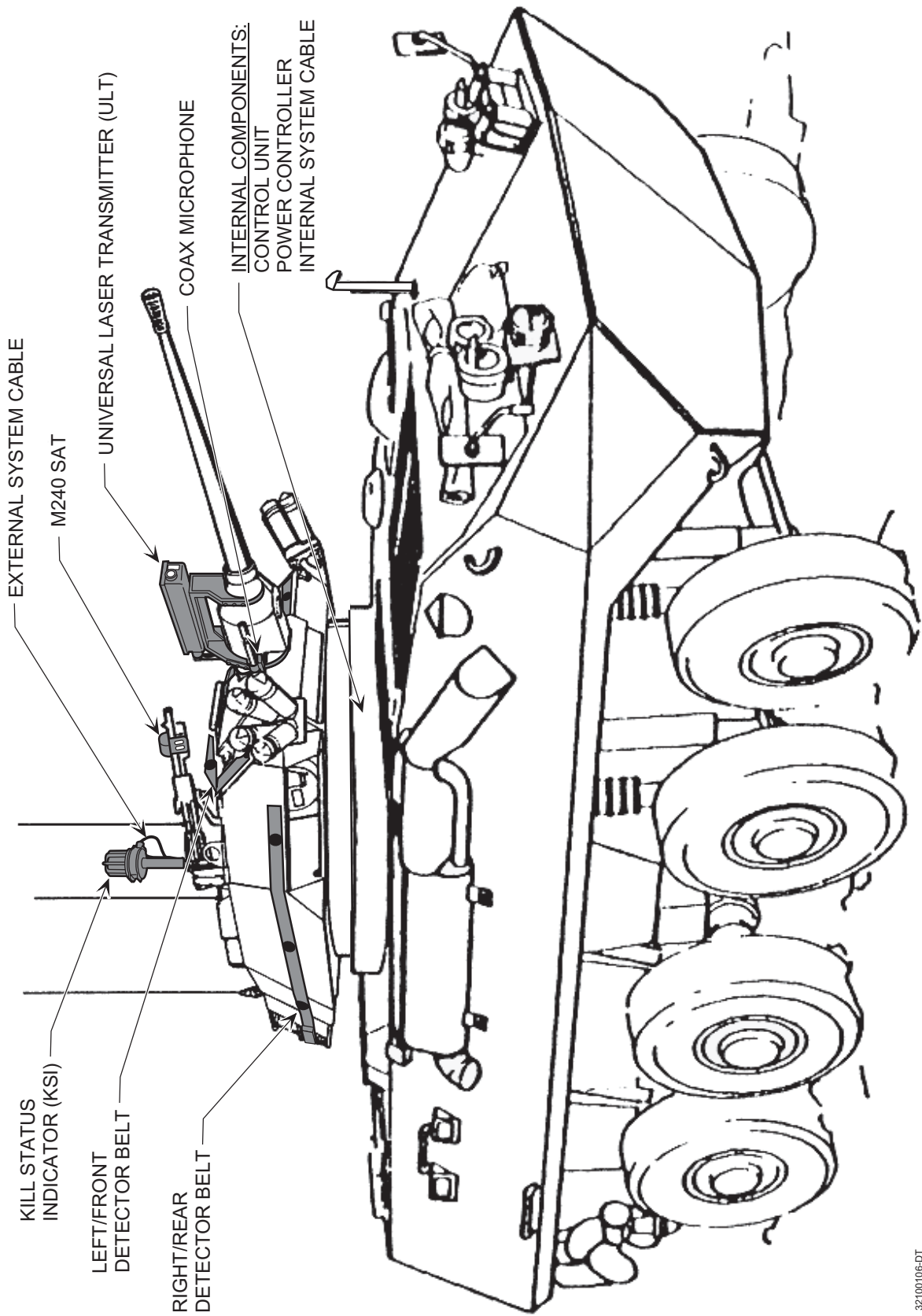
**1.11.2.3 M240E1 Machine Gun (all LAVs).** The M240E1 machine gun is fired using normal procedures. The gun is fitted with a BFA and loaded with blank ammunition. The sound/flash of blank fire is sensed by the M240 SAT mounted on the machine gun's barrel. The laser transmitter will operate as long as blank ammunition is being fired.

**1.11.2.4 Detector Belt Systems.** Two (2) detector belts are mounted on each LAV. Each belt is electrically divided into two (2) zones for a total of four (4) zones, which represent the sides of the vehicle. They generate electrical signals that are fed to a decoder in the KSI.

**1.11.2.5 Kill Status Indicator (KSI).** Receives MILES messages from the detector belts, decodes them and then routes all valid messages to the Control Unit (CU). It has an optical port for external interface with the CD/TDTD (Controller Gun) and a motion sensor. It is mounted to provide 360° visibility of the flashing light. Refer to Table 1-4, Kill Indication Chart for a list of the types of kills and the KSI indications.

Table 1-4. Kill Indication Chart.

TYPE OF HIT/KILL	NUMBER OF KSI FLASHES	AUDIBLE INDICATION
<b>Vehicle</b>		
Shoulder-Mounted Assault Weapon (SMAW) Spotting Rifle	1 Flash	None
Near Miss	2 Flashes	Near Miss.
Hit	4 Flashes	Hit.
Mobility Kill	4 Flashes	Hit, Mobility. Stop Vehicle. (The crew has 20 secs to bring the vehicle to a stop.)
Fire Power Kill	4 Flashes	Hit, Fire Power.
Communications Kill	4 Flashes	Hit, Commo Kill. (disables external communications only)
Catastrophic Kill	Flashes Continuously	Vehicle Kill
Administrative Kill	Flashes Continuously	Vehicle Kill
Cheat Kill	Flashes Continuously	Cheat Kill
Reset/Resurrect	1 Flash	Reset/Resurrect
<b>IWS</b>		
Near Miss	N/A	2 Beeps
Kill	N/A	Continuous
Administrative Kill	N/A	Continuous
Cheat Kill	N/A	Continuous
Reset/Resurrect	N/A	4 Beeps
<p><b>Notes:</b> Cheat Kill will occur during a Mobility Kill if the vehicle does not stop within the allotted 20 seconds or moves after it has stopped. A Cheat Kill will occur when disconnecting any of the following pieces of vehicle equipment: KSI, any Detector Belt/Array, or Power Controller (must be reconnected for cheat to be indicated), or removing the battery on IWS Console Data Processing Control Unit (DPCU).</p> <p>The Kill Status Indicator (KSI) is issued as part of a separate equipment list.</p> <p>In the event of a Catastrophic or Communications Kill, external communications can be over-ridden for <b>EMERGENCIES ONLY</b> by pressing the USER INFO push button on the Control Unit, selecting communication override and pressing the ENTER push button.</p>		



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Figure 1-1. LAV-25.

**1.11.2.6 Coax Microphone.** The coax microphone picks up the sound of the trigger and blank fire, and causes the ULT on the main gun to fire. The Coax Microphone is mounted on the gas tube under the barrel of the machine gun.

**1.11.2.7 Universal Laser Transmitter (ULT).** The ULT has the capability of adjusting laser power output to simulate the range capability of various weapon types. It is boresighted using two knobs located on the rear of the ULT. It also has a FlashWESS which simulates a non-pyrotechnic visual cue of the fire rate of a 25 mm weapon.

**1.11.2.8 Control Unit (CU).** The CU provides the following: casualty assessment using Pk tables, records/stores event data (500 events max), provides system real-time clock, monitors system for hardware failures and for cheat attempts, commands KSI to flash, and interrupts vehicle external communications during Communications/Catastrophic kills.

**1.11.2.9 Power Controller.** The Power Controller contains a rechargeable battery pack and operates from the vehicle power to maintain the battery charge. It automatically switches to the internal battery to provide power when the vehicle power drops lower than the internal battery power, or when the vehicle power is removed from the MILES 2000 system.

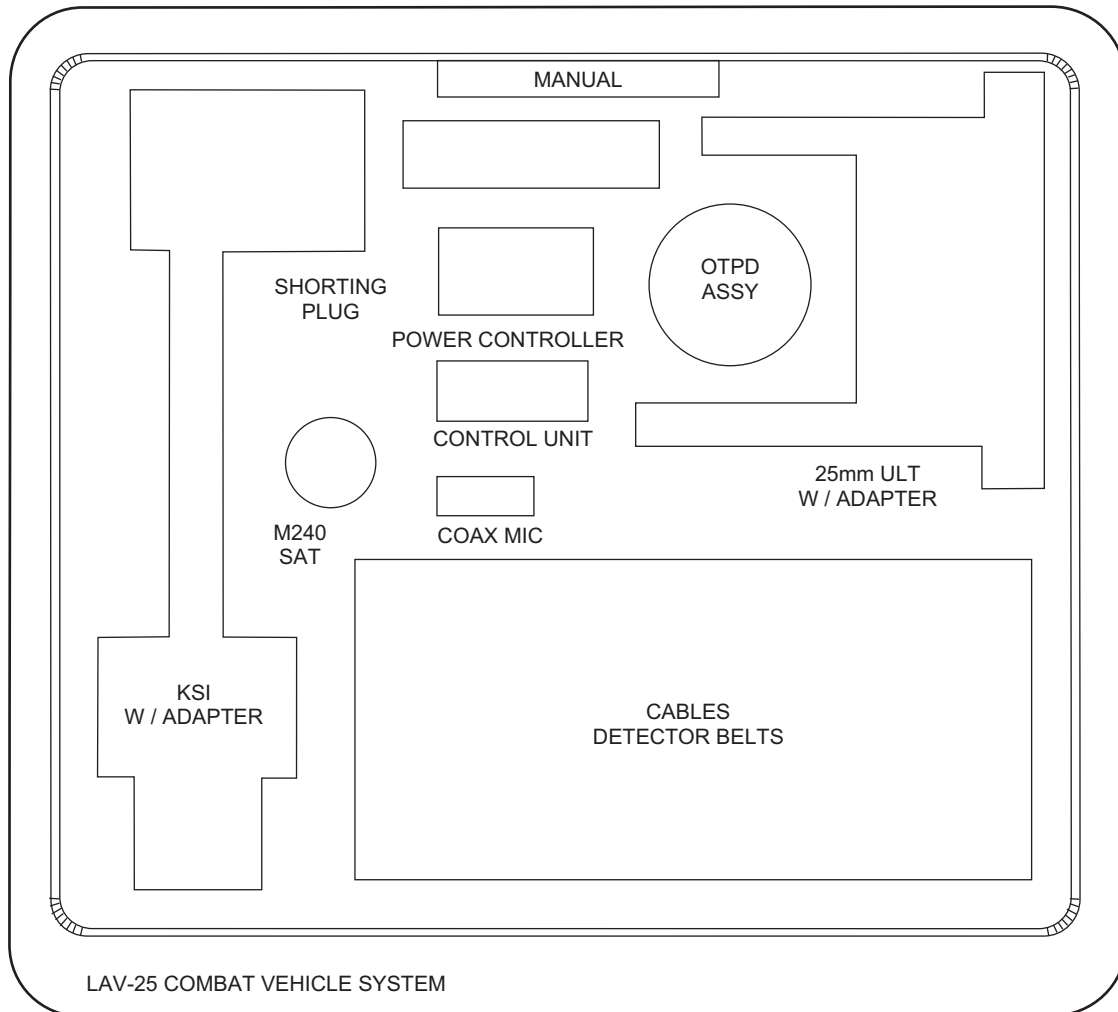
**1.11.2.10 Optical Turret Positioning Device (OTPD).** An OTPD located on the right rear corner of the hull allows the CU to calculate the effect of laser fire on the vehicle based on the position of the turret with respect to the hull. The OTPD sends IR signals to the detectors on the turret, letting the CU know the relationship between any side of the turret and the hull. When a specific part of the turret is hit with laser fire, the CU determines which side of the hull is facing the fire.

Table 1-5 defines the Kit/Equipment List.

Table 1-5. Kit/Equipment List.

PACKAGE NOMENCLATURE: SIMULATION SYSTEM, CVS, LAV-25 VEHICLE				
PACKAGE PERTAINS TO: 146650-2				
PACKAGE CONTENTS				
QUANTITY	NAME OF ITEM	DWG NO.	PART NO.	NOTES
1	SAT ASSY, M240G	148460	148460-1	
1	CONTROL UNIT ASSEMBLY	146402	146402-2	
1	MAST ASSY, KILL STATUS IND-LAV-25	146670	146670-2	
1	ULT ADAPTER ASSY ULT, 25 MM	146609	146609-2	
1	OPTICAL TURRET POSNG DEVICE ASSY	146408	146408-2	
1	POWER CONTROLLER ASSY	146409	146409-2	
1	CABLE ASSY, COAX MICROPHONE	146430	146430-1	
1	DETECTOR BELT ASSY, LEFT-FRONT, LAV-25	146660	146660-1	
1	DETECTOR BELT ASSY, RIGHT-REAR, LAV-25	146662	146662-1	
1	CABLE ASSY, INTERNAL-LAV-25	146654	146654-1	
1	CABLE ASSY, EXTERNAL-LAV-25	146655	146655-1	
1	PLUG, SHORTING	9352767	9352767	5
1	TRANSIT CASE-CVS, LAV-25	146652	146652-1	4
8	WEDGE ASSY, DETECTOR BELT	146435	146435-1	
1	OPERATOR'S MANUAL		TD 9-6920-703-10	
1	GROMMET, PERISCOPE SEAL	146509	146509-7	
6	STRAP, BLK, 3/4" X 6"			1
6	STRAP, BLK, 3/4" X 8"			2
2	STRAP, BLK, 3/4" X 12"			3
1 OZ	ANTISEIZE LUBRICANT, 1 OZ TUBE		MIL-A-907	6
<b>NOTES:</b> 1. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170790. THIS REEL CONSISTS OF 1200 STRAPS. 2. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170091. THIS REEL CONSISTS OF 900 STRAPS. 3. MAY BE PURCHASED IN BULK QUANTITY AS PART OF VELCRO USA, CAGE CODE 11153, PART NO. 170782. THIS REEL CONSISTS OF 600 STRAPS. 4. MARK THE TRANSIT CASE (2 PLACES) WITH THE APPLICABLE DASH NUMBER AFTER THE BASIC PART NUMBER. THE MARKING SHALL BE 6.35mm HIGH CHARACTERS MINIMUM, COLOR WHITE NO. 27925 IN ACCORDANCE WITH FED-STD-595. LOCATE AS SHOWN ON TRANSIT CASE DRAWING. 5. CAGE CODE 19200. 6. ALTERNATES: ANTISEIZE LUBRICANT, PART NO. 51001, CAGE CODE 05972, IN 1 OZ TUBE OR PART NO. 767, CAGE CODE 05972, OR PART NO. C5A, CAGE CODE 05972.				

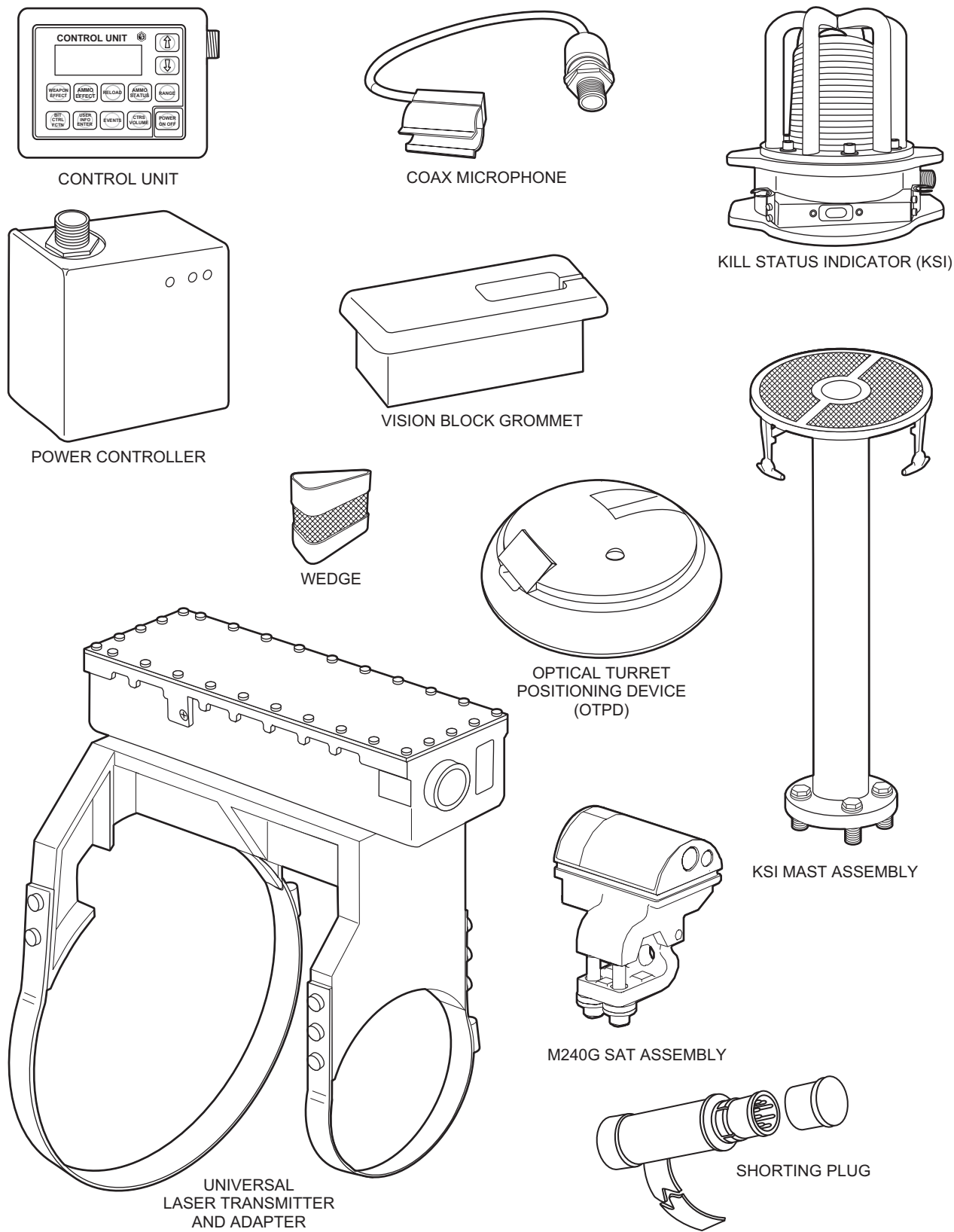
See Figures 1-2 and 1-3 located at the end of this table.



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PN 146652

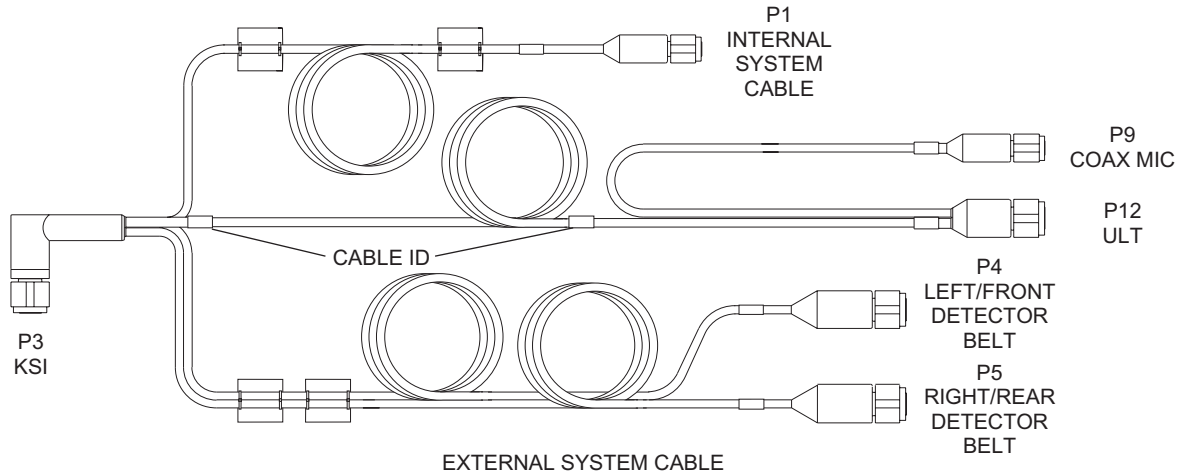
**Figure 1-2. Transit Case.**



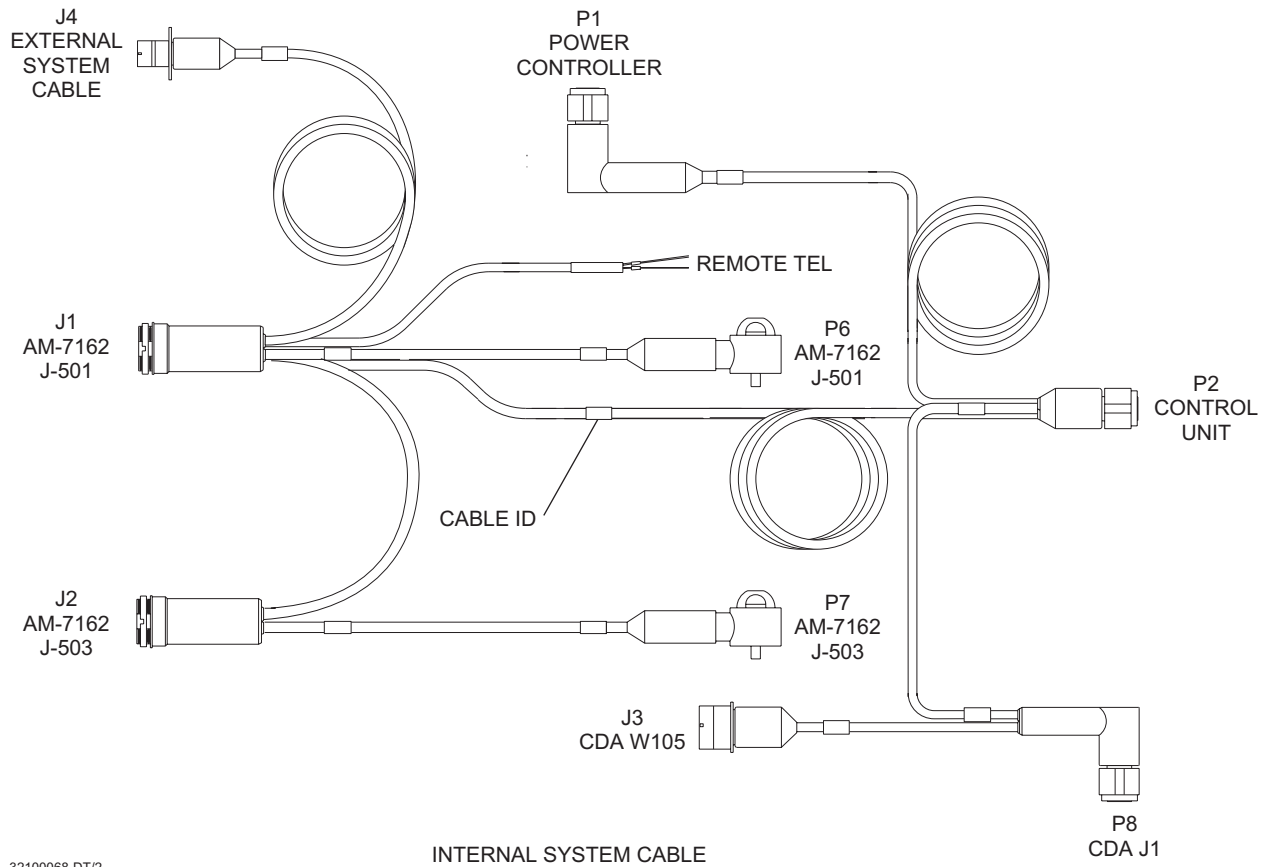


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Figure 1-3. System Components (Items not to Scale) (Sheet 1 of 3).

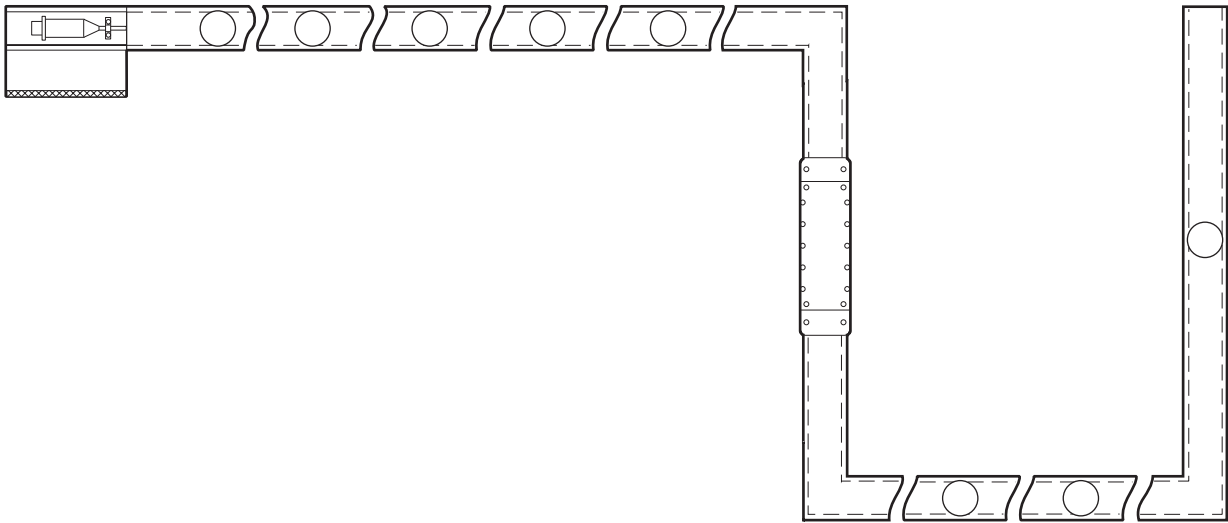


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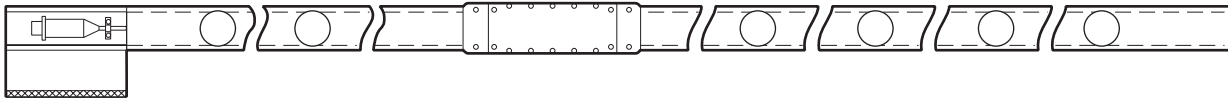


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Figure 1-3. System Components (Items not to Scale) (Sheet 2 of 3).



LEFT/FRONT DETECTOR BELT



RIGHT/REAR DETECTOR BELT

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Figure 1-3. System Components (Items not to Scale) (Sheet 3 of 3).

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## CHAPTER 2 OPERATING INSTRUCTIONS

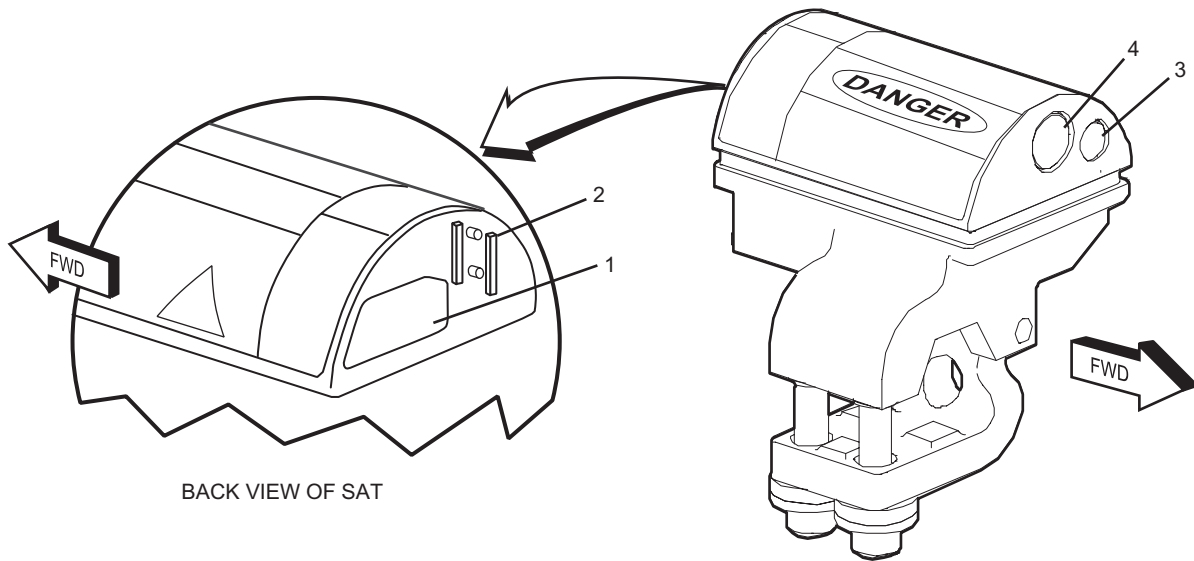
### SECTION I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

#### 2.1 EQUIPMENT CONTROLS AND INDICATORS.

The following figures, as listed in Table 2-1, illustrate and describe the MILES 2000 LAV operating controls and indicators.

**Table 2-1. Controls and Indicators Reference.**

ITEM	FIGURE NO.
Small Arms Transmitter (SAT)	2-1
Detector Belts	2-2
Kill Status Indicator (KSI)	2-3
Coax Microphone	2-4
Universal Laser Transmitter (ULT)	2-5
Control Unit (CU)	2-6
Power Controller	2-7
Optical Turret Positioning Device (OTPD)	2-8

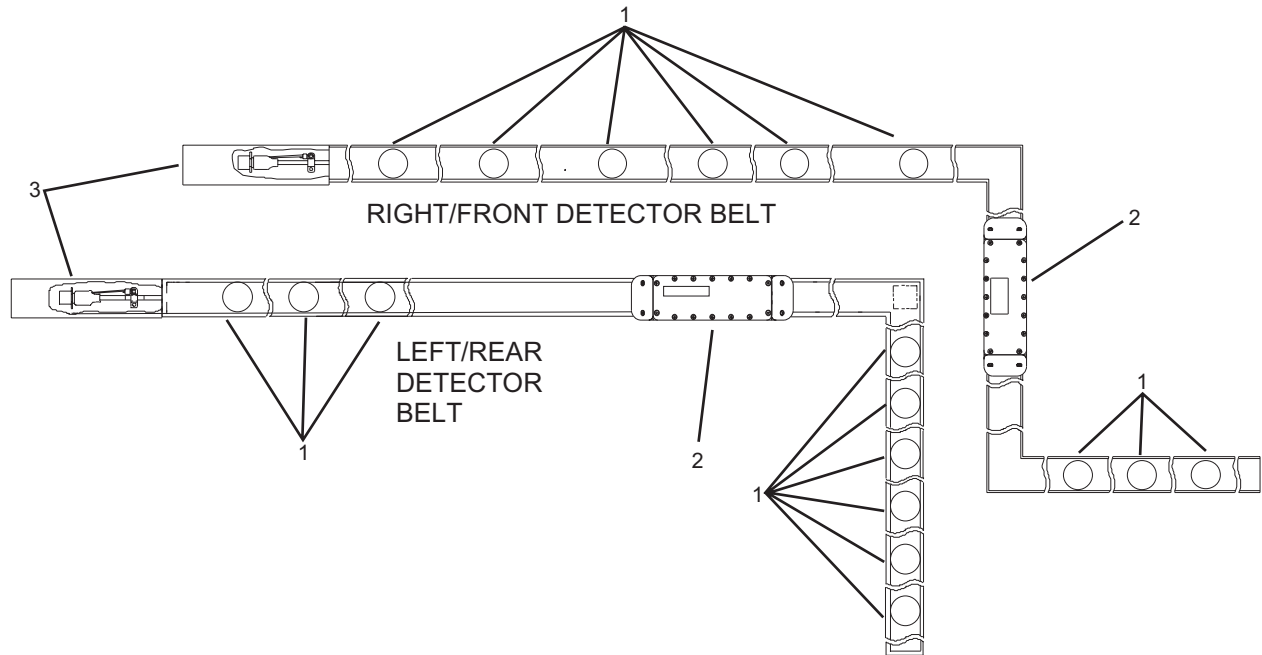


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M240G SAT ASSEMBLY

**Figure 2-1. Small Arms Transmitter (SAT).**

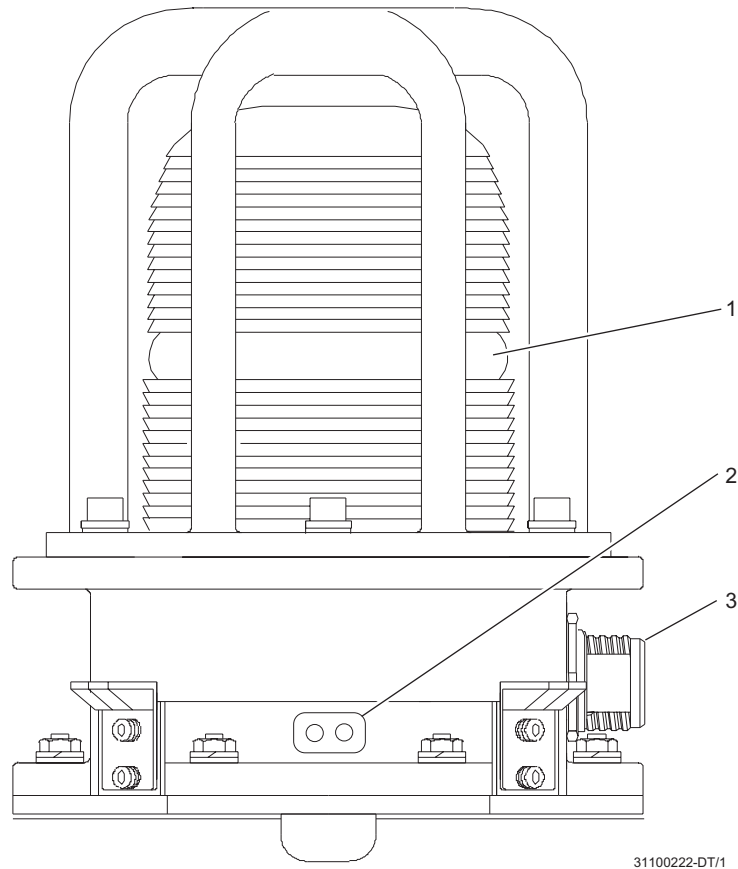
1. **FIRING INDICATOR AND IR TRANSMITTER/RECEIVER PORT.** Firing indicator illuminates when the SAT is fired as a visual aide to the soldier/marine. IR port provides a link between the weapon and the manworn.
2. **ALIGNMENT SHAFTS.** Used to adjust the laser alignment with the Automatic Small Arms Alignment Fixture (ASAAF).
3. **BLANK SENSOR WINDOW.** Allows light flash from blank firing of the weapon to be sensed so that the SAT laser will be transmitted.
4. **LASER OPTICAL WINDOW.** Window through which the laser beam is transmitted.



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**Figure 2-2. Detector Belts.**

1. DETECTORS. Detect laser transmissions that are being fired at the vehicle.
2. AMPLIFIER. Amplifies coded laser signals that simulate incoming fire, and forwards them on to the KSI.
3. CONNECTOR. System Cable connector.

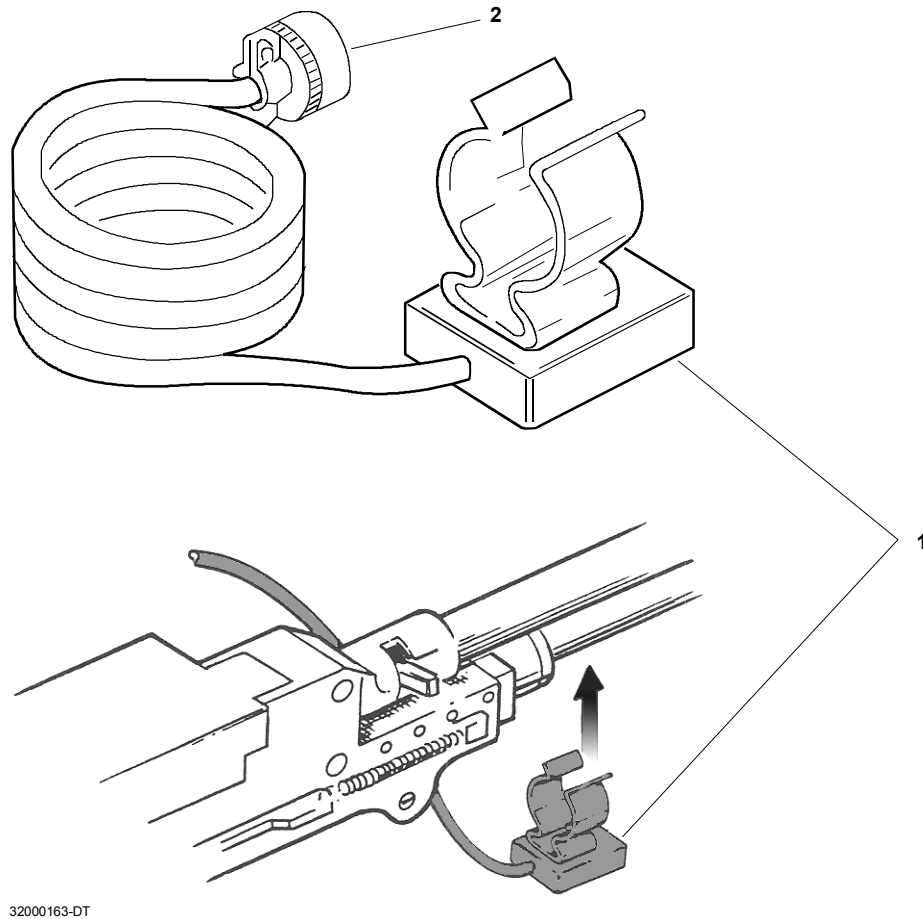


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**Figure 2-3. Kill Status Indicator (KSI).**

1. **VISUAL STROBE.** Provides a 360E azimuth and 60E elevation optical output when a vehicle is hit (housed in an amber dome).
2. **OPTICAL PORT.** Bidirectional IR communication link used by CD/TDTD (Controller Gun) for uploading and downloading data.
3. **CONNECTOR.** System Cable connection.

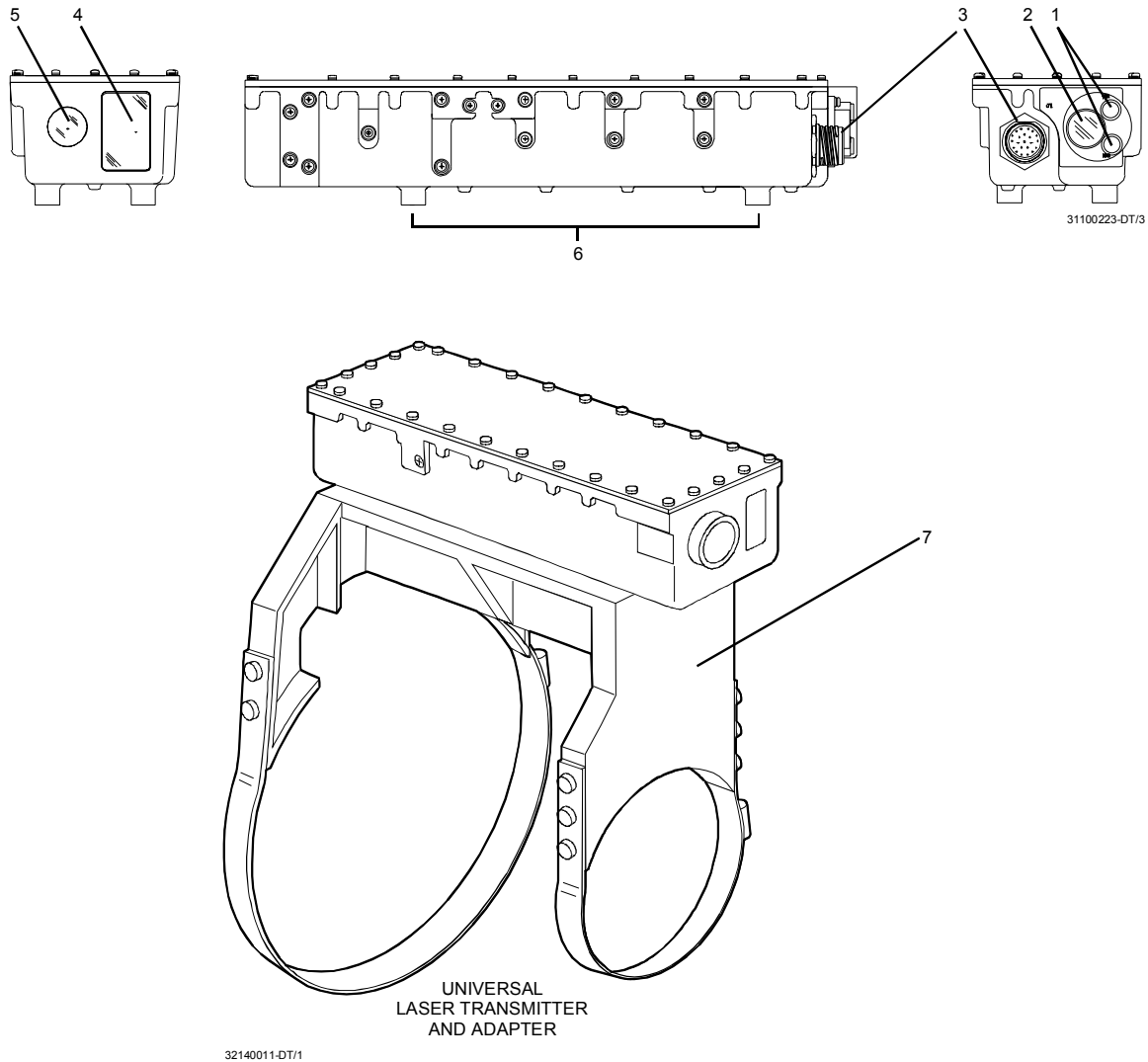




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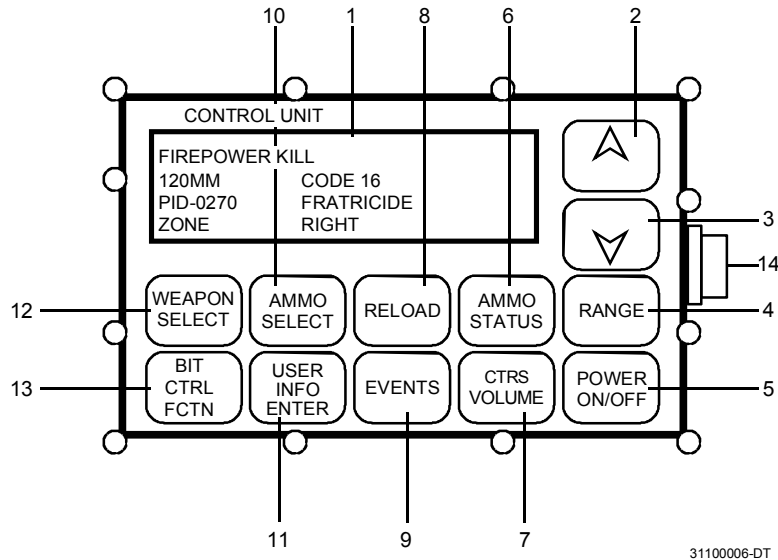
**Figure 2-4. Coax Microphone.**

1. **COAX MICROPHONE.** The Coax Microphone picks up the sound of blank fire and machine gun trigger, which causes the ULT on the main gun to fire. The Coax Microphone is mounted on the gas tube under the barrel of the coax machine gun.
2. **CONNECTOR.** Cable connector from coax microphone to external system cable.



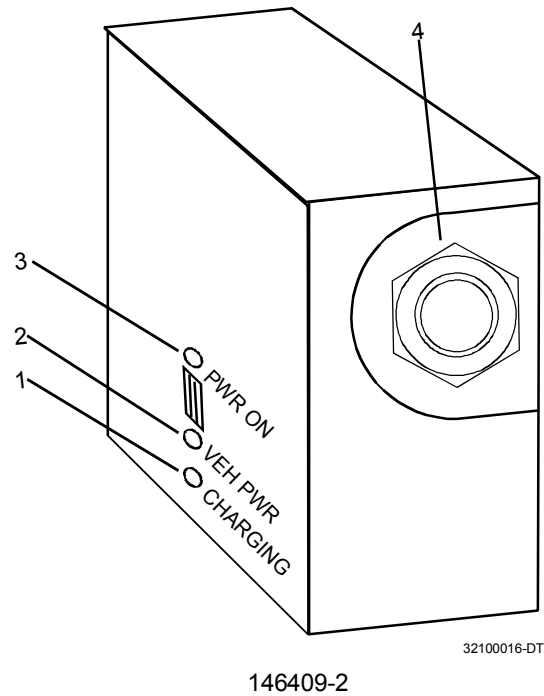
**Figure 2-5. Universal Laser Transmitter (ULT).**

1. BORESIGHT ADJUSTMENT KNOB. Used to align the ULT scope to the target.
2. SCOPE REAR SIGHT. Used to align the main gun with the target.
3. CONNECTOR. Cable connector from the CU to the ULT.
4. FLASHWESS. Indicates when the main gun has been fired.
5. LASER OPTICAL WINDOW. Window through which the ULT laser beam is transmitted.
6. ADAPTER MOUNTING POSTS.



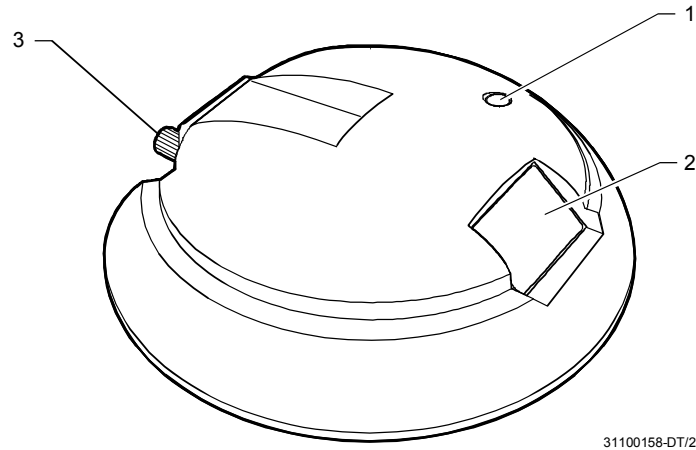
**Figure 2-6. Control Unit (CU).**

1. DISPLAY WINDOW. Displays events and system messages. (Example display shown.)
2. SCROLL UP PUSH BUTTON. Scrolls display up when pressed, and also moves the cursor.
3. SCROLL DOWN PUSH BUTTON. Scrolls display down when pressed, and also moves the cursor.
4. RANGE PUSH BUTTON. Allows the operator the option to input his estimate of target range.
5. POWER ON/OFF PUSH BUTTON. Enables/disables the MILES 2000 System.
6. AMMO STATUS PUSH BUTTON. Displays number of rounds remaining for selected weapon.
7. CTRS/VOLUME PUSH BUTTON. CTRS allows user to adjust illumination of display. VOLUME allows user to adjust audio level to the vehicle headset.
8. RELOAD PUSH BUTTON. Causes the system to load any available selected remaining ammunition shown in the display window.
9. EVENTS PUSH BUTTON. Allows the operator to review the 16 most recent events on the display window.
10. AMMO SELECT PUSH BUTTON. Allows the operator to view the different ammunition quantities and types available for a main gun or Tube-Launched Optically-Tracked Wire-Guided Weapon System (TOW).
11. USER INFO/ENTER PUSH BUTTON. USER INFO Disable allows operator the ability to check his PID and vehicle type, override the communications Disable function under Communications/ Catastrophic Kill conditions in an emergency. ENTER allows controller to enter commands selected in Control Mode.
12. WEAPON SELECT PUSH BUTTON. Allows the operator the option to select the desired weapon to be used.
13. BIT/CTRL FCTN PUSH BUTTON. Built-In-Test (BIT) executes a system BIT with the results shown in the display window. CTRL FCTN allows controller to select vehicle platform type, blank or dryfire, coax activation, and FlashWESS or ATWESS activation, etc.
14. CONNECTOR. System Cable connection.



**Figure 2-7. Power Controller.**

1. CHARGING INDICATOR (146409-2). Illuminates when battery voltage drops below 27.5 Vdc, and battery is charging.
2. VEHICLE POWER PRESENT INDICATOR. Light Emitting Diode (LED) blinks continuously when vehicle power is at the CVS system, and the internal batteries are being trickle charged.
3. 10.5 VDC POWER PRESENT INDICATOR. LED blinks continuously when 10.5 Vdc power is ON.
4. CONNECTOR. System Cable connection.



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**Figure 2-8. Optical Turret Positioning Device (OTPD).**

1. POWER ON INDICATOR. Illuminates for 6 seconds upon installation of a new 9-volt battery.
2. INFRARED TRANSMITTER WINDOW. Used by the OTPD to transmit an infrared (IR) signal allowing the Combat Vehicle System (CVS) to determine the position of the turret when receiving an incoming MILES 2000 message.
3. BATTERY DOOR SCREW. Turn counterclockwise to remove battery and clockwise to secure battery in battery compartment.

## SECTION II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

Preventive Maintenance Checks and Services (PMCS) will ensure that the MILES 2000 equipment will be ready for operation and perform satisfactorily throughout its mission. Preventive maintenance checks consist of performing a systematic inspection to discover defects before they result in operational failure of the equipment. Defects or malfunctions discovered by the crew during use of the MILES 2000 equipment, or as a result of performing maintenance checks and services, will be turned into the issuing authority.

### 2.2 INTRODUCTION TO PMCS TABLE.

Operator PMCS are shown in Table 2-2. Tasks to be performed before operation appear in the “B” column under the heading “Interval.” Tasks to be performed during operation are checked in the “D” column. Tasks to be performed after operation are checked in the “A” column. Tasks to be performed weekly are checked in the “W” column, with tasks to be performed monthly checked in the “M” column.

#### NOTE

Cleaning of MILES 2000 equipment requires no special procedures or the use of cleaning compounds/chemicals. Clean all areas, including the lens area by: (1) wiping dirt and dust away using a soft rag; (2) clean with a soft cloth rag dampened with water; and (3) polish to a brilliant luster with a finishing cloth. **The use of chemicals to clean MILES equipment, including the cleaning of lenses, is not recommended.**

**NOTE**

Within designated interval, these checks are to be performed in the order listed.

B – Before Operation  
D – During Operation  
A – After Operation

W - Weekly  
M - Monthly

**Table 2-2. Operator Preventive Maintenance Checks and Services.**

ITEM NO.	ITEM TO BE INSPECTED	INTERVAL					PROCEDURES CHECK FOR AND HAVE REPAIRED	EQUIPMENT IS NOT READY/AVAILABLE IF:
		B	D	A	W	M		
1.	Small Arms Transmitter (SAT)	✓		✓		✓	Inspect for dirty or damaged window. Clean window.	Window broken, cracked, or missing.
2.	Control Unit (CU)	✓		✓		✓	Inspect for cracks in display window and membrane switches.	Display window or membrane switch broken.
		✓	✓				Check for display in display window when powered on.	No display in display window when powered on.
3.	Kill Status Indicator (KSI)	✓		✓		✓	Inspect for cracks in plastic lens (amber dome) of visual strobe.	Amber dome plastic lens cracked.
				✓		✓	Check for optical port damage.	Lens broken, cracked or missing.
4.	Universal Laser Transmitter (ULT) LAV-25	✓		✓		✓	Inspect for dirty or damaged lens.	Lens broken or cracked.
			✓	✓		✓	Make sure boresight knobs are securely attached to shafts.	Knobs broken or missing.
				✓		✓	Inspect connector for dirty or bent pins.	Pins dirty, bent or missing.
5.	Optical Turret Positioning Device (OTPD) LAV-25	✓					Check for battery in unit.	Battery not present.
				✓		✓	Inspect for cracks in plastic lens.	Lens cracked.

6.	Power Controller	✓		✓		✓	Inspect for damaged connector.	Broken connectors. Bent or missing pins.
				✓		✓	Inspect for acid leaks.	Acid is present.
7.	Detector Belts	✓		✓		✓	Wipe all detectors/connectors clean. Inspect harnesses for damage that would prevent normal operation.	Detectors broken or missing. Connector pins dirty, bent or missing. Amplifier broken.

**Table 2-2. Operator Preventive Maintenance Checks and Services-Continued.**

ITEM NO.	ITEM TO BE INSPECTED	INTERVAL					PROCEDURES CHECK FOR AND HAVE REPAIRED	EQUIPMENT IS NOT READY/AVAILABLE IF:
		B	D	A	W	M		
8.	Coax Microphone	✓		✓		✓	Inspect microphone for obvious damage. Make sure clip is securely attached.	Cracked or broken casing. Clip loose or missing.
		✓	✓				Wipe connector clean and inspect for damage.	Broken connector. Bent or missing pins.
		✓		✓		✓	Inspect cord for damage.	Broken or bare wires are broken.
9.	Cable and Connector Assemblies	✓		✓		✓	Inspect for worn or bare wires.	Broken or bare wires are present.
		✓		✓		✓	Inspect connectors for damage or broken pins.	Broken connectors. Bent or missing pins.



## SECTION III. OPERATION UNDER USUAL CONDITIONS

### 2.3 ASSEMBLY AND PREPARATION FOR USE.

MILES 2000 equipment must be inspected and prepared as described in the following paragraphs prior to use.

#### NOTE

When applying fastener tape, always apply the “hook” type tape to the holding surface (the surface to which an item will be installed), and the “pile” type tape to the item being installed. For example, when installing the Control Unit (CU) in the LAV, you would apply the hook tape to the side wall of the commander’s station, and the loop tape to the CU. The CU pile tape can then be attached to the side wall hook tape, firmly securing the CU.

#### 2.3.1 Fastener Tape.

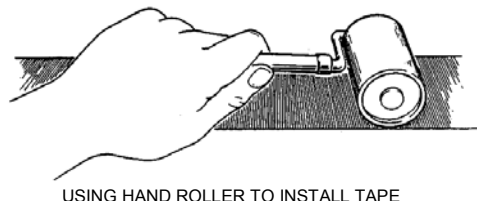
**2.3.1.1 Fastener Tape Application and Preparation.** Much of the MILES 2000 equipment is mounted with fastener tape. If fastener tape is not affixed to the vehicle already, or if existing tape is worn and/or unserviceable, remove any existing tape and use the following directions to apply/reapply the fastener tape:

- a. Mark the vehicle for primer/fastener tape application along the areas where the belts will be routed. Those areas are described in the applicable paragraphs.
- b. Clean all areas where fastener tape is to be installed with water, a brush, if necessary, and rags. Tape will not adhere to a dirty, wet, or oily surface.

#### WARNING

Tape primer is toxic and highly flammable. Do not spray near heat, open flame, or sparks. Use primer only in well ventilated areas. Do not permit smoking in the area. Injury to personnel may result.

- c. Spray a heavy coat of tape primer on the cleaned areas along the strip where the fastener tape will be applied. Allow primer to dry thoroughly (follow the directions on the primer can), before applying the fastener tape. (See Figure 2-9.)
- d. Cut tape to the appropriate lengths as you need it for the equipment installation.



#### NOTE

Not in MILES Kit.

**Figure 2-9. Fastener Tape Preparation.**

**NOTE**

The fastener tape has a protective backing. When applying short lengths of tape, remove all the backing before installing the tape. When applying longer lengths, remove the backing gradually as you apply the tape. This will help keep the tape adhesive from sticking to itself or to the wrong surface.

The quadrants of the vehicle-Left/Front, Right/Front, Left/Rear, Right/Rear-are determined from the driver's viewpoint, which would be as facing towards the front of the vehicle. All installation instructions are given from this viewpoint, even though at times the installer may be facing to the rear of the vehicle.

**NOTE**

**MILES equipment installation procedures should be followed as outlined in the technical manual. If the following procedures CANNOT be followed due to cable length or additional vehicle equipment, then place the MILES equipment in the best and safest location.**

**2.3.2 Installation of MILES 2000 Equipment on LAV-25.**

**WARNING**

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

**NOTE**

For the application of primer and fastener tape to MILES equipment, refer to paragraph 2.3.1.1.

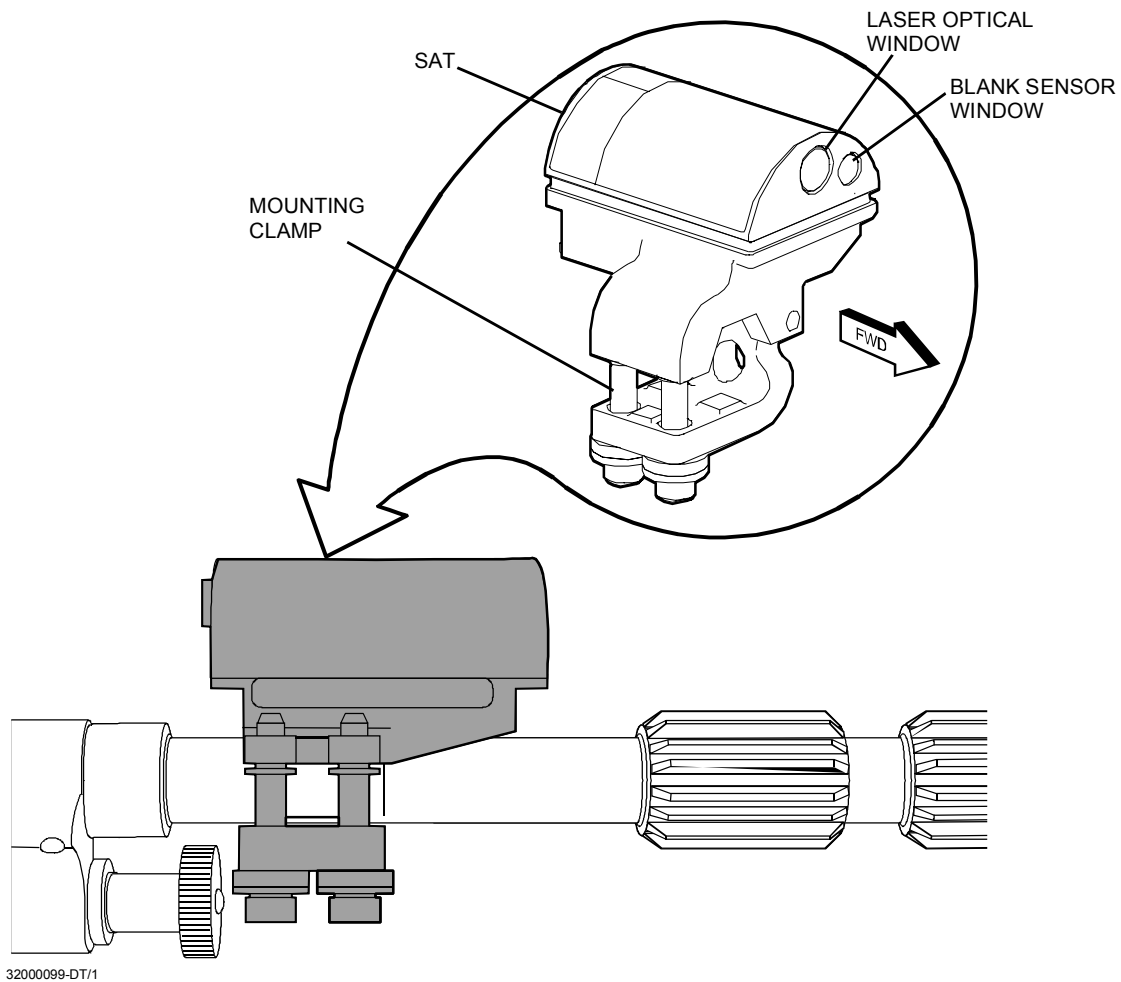
**2.3.2.1 M240 Small Arms Transmitter (SAT).**

- a. Remove the SAT from the transit case. The SAT and mounting bracket are one (1) unit. Make sure the SAT is clean and dry, and not cracked or broken.
- b. Inspect the Blank Sensor Window and the Laser Optical Window, making sure they are not cracked, broken, or missing. Make sure the mounting clamp is operational.
- c. Inspect the IR Transmit/Receive Window making sure that it is not cracked, broken, or missing.
- d. Replace and report damaged equipment, as required.

**CAUTION**

Use care when starting capscrews not to cross threads. DO NOT use any tools to tighten capscrews until directed.

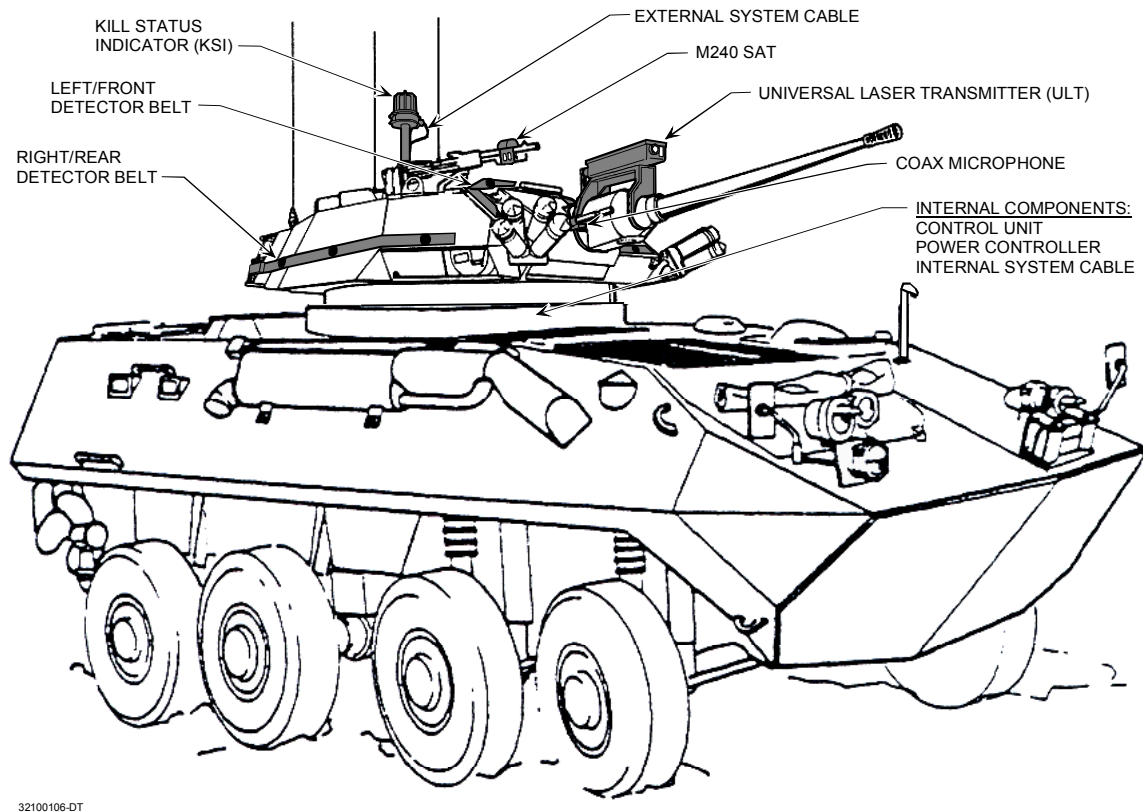
- e. Attach the SAT to the barrel of the pintle-mounted M240 machine gun and torque to 85 inch-pounds using the torque wrench supplied in the ASAAF kit. (See Figure 2-10 for proper placement.)



**Figure 2-10. M240 w/SAT.**

- f. Replace and report damaged equipment, as required.

**2.3.2.2 Detector Belts.** (See Figure 2-11.)



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**Figure 2-11. LAV-25.**

- a. Remove belts from the transit case. Lay out belts to assess the shape and size of the belts, as well as the placement of the System Cable connector on each belt.
- b. Wipe all detectors clean.
- c. Inspect connectors for dirt and/or damage.
- d. Replace and report damaged equipment, as required.

- e. Working with short sections, press the **Right/Rear** detector belt starting at the Left/Rear corner of the bustle rack and run along the bottom edge of the turret on the right side. (See Figure 2-12.) The connector for the External System Cable should be positioned at the Left/Rear corner of the turret.

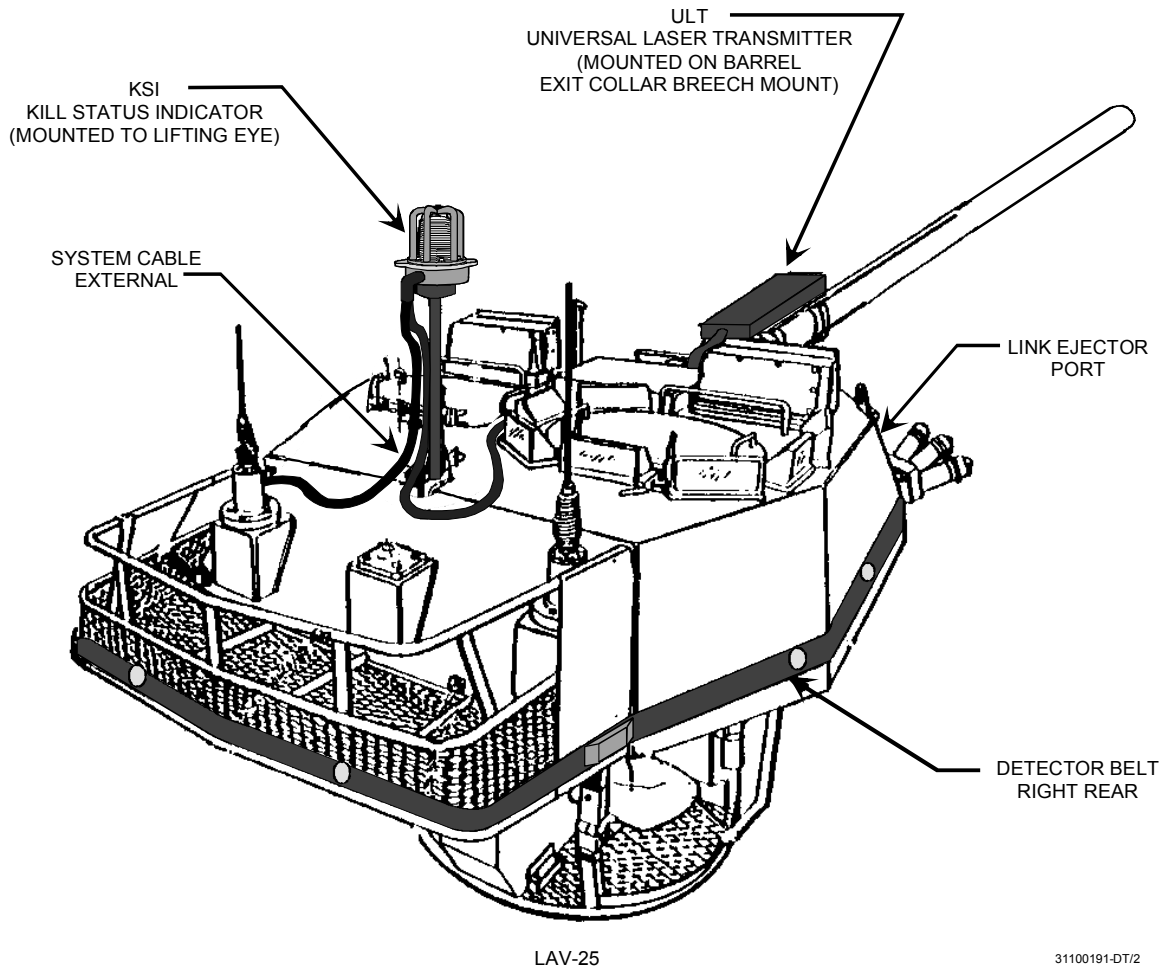
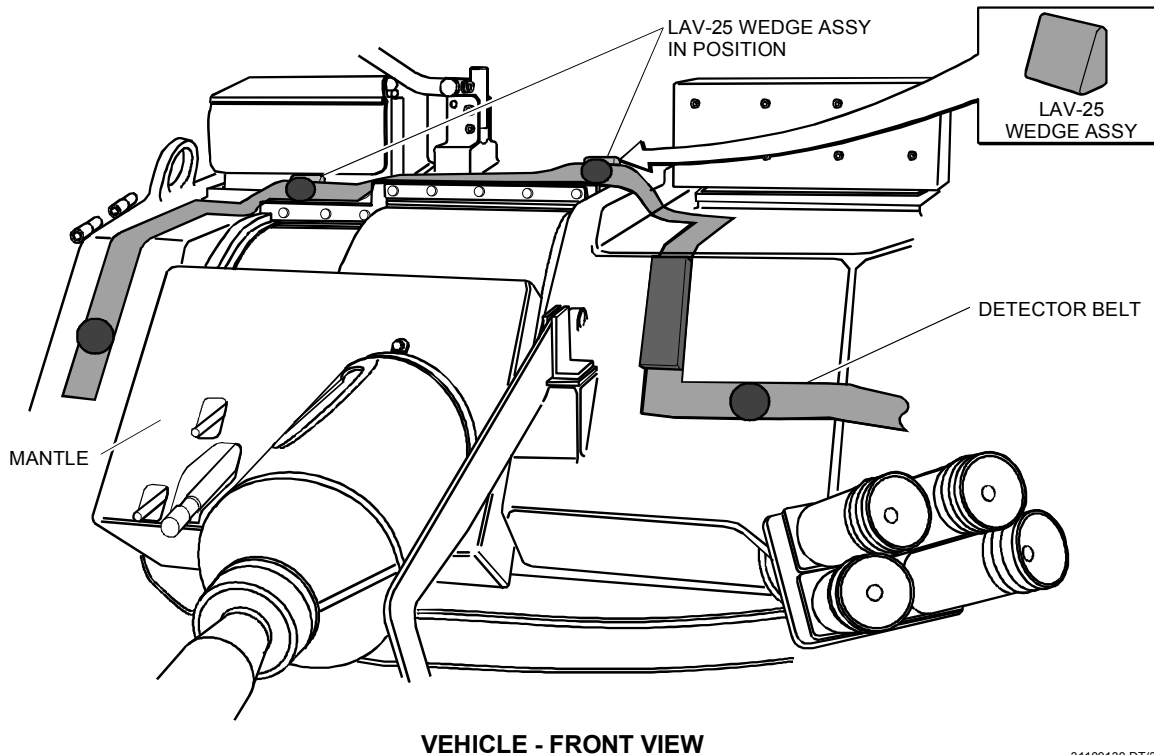


Figure 2-12. Placement of Right/Rear Detector Belt.

**CAUTION**

To avoid damaging the Detector Belts on the LAV-25, place the belt 2 inches away from the rear edge of the sliding mantle plate. (See Figure 2-13.)

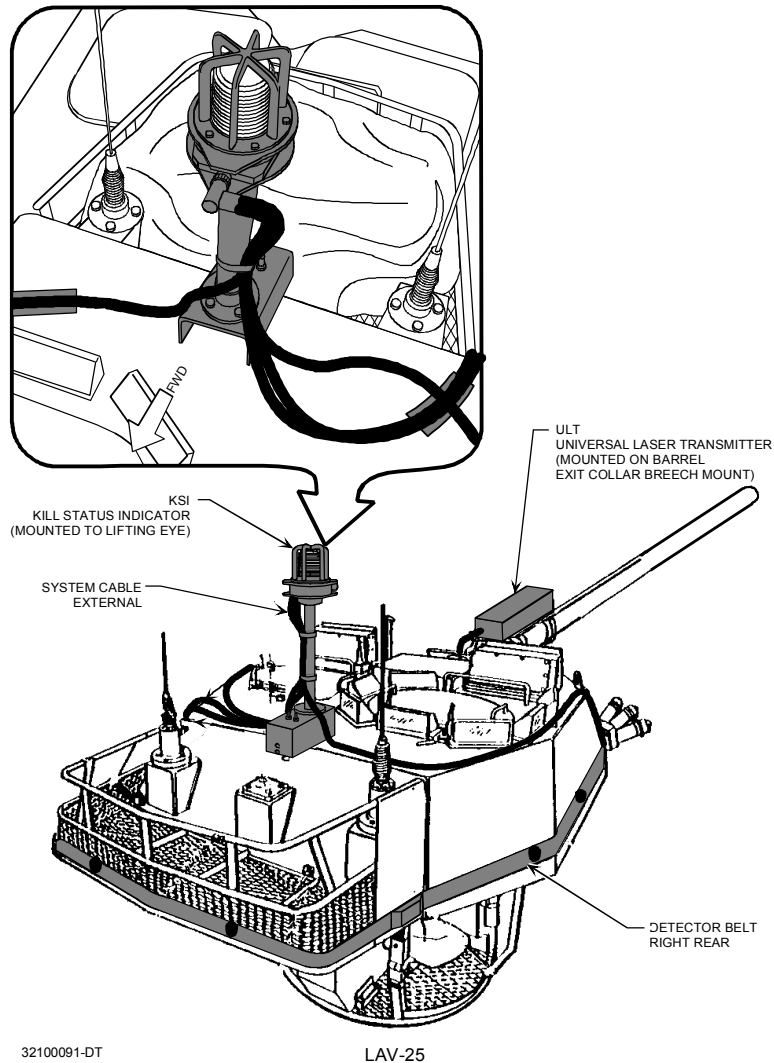


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**Figure 2-13. Placement of Left/Front Detector Belt.**

- f. Working with short sections, press the **Left/Front** detector belt starting with the squared collar being installed around the main gun. The top of the collar should not be taped flat against the turret as there are two (2) wedges (Figure 2-13), included in the MILES 2000 kit, that will be mounted directly behind the two top detectors. Route the remainder of the belt along the bottom left edge of the turret to the Left/Rear corner. The connector for the External System Cable should be positioned at the Left/Rear corner of the turret.
- g. Attach the wedges to the fastener tape and ensure they are secure.
- h. Attach the belt to the wedge so that the detectors are standing up off of the vehicle.

**2.3.2.3 Kill Status Indicator (KSI).** (See Figure 2-14.)



**Figure 2-14. KSI Installation.**

- a. Remove the KSI with the attached mast assembly from the transit case and inspect the KSI for damage.
- b. Inspect strobe assembly of the KSI for cracks.
- c. Inspect connector for dirt and/or damage.
- d. Replace and report damaged equipment, as required.
- e. Detach the U-bolt clamp from the mast assembly, but keep the U-bolt clamp with you.
- f. Place the KSI/mast assembly over the center lifting eye of the turret with the External System Cable connector pointing toward the rear of the vehicle.
- g. Secure with the U-bolt clamp.

#### 2.3.2.4 Coax Microphone.

- a. Remove the Coax Microphone assembly from the transit case, and inspect the microphone for any damage that would prevent installation or operation.
- b. Inspect the connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. Install a blank-fire adapter on the Coax Machine gun.
- e. Clip the microphone to the gas tube beneath the coax machine gun barrel. Ensure that the Coax Microphone Cable is not in contact with the barrel. (See Figure 2-15.)

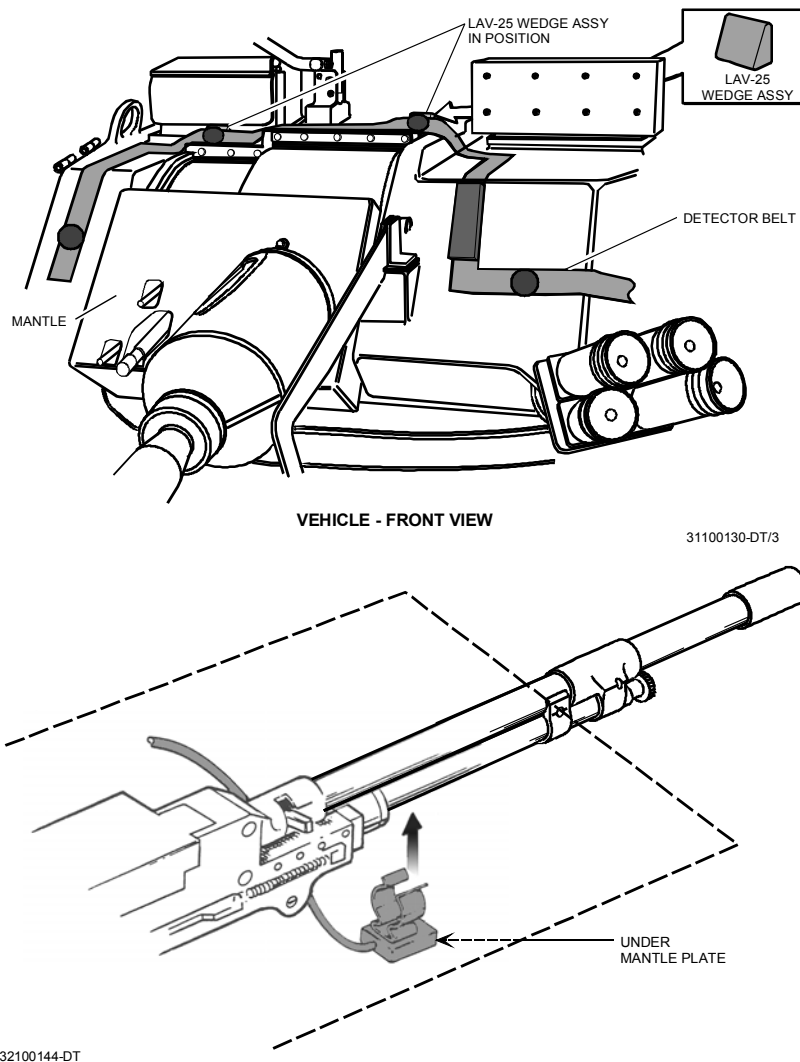
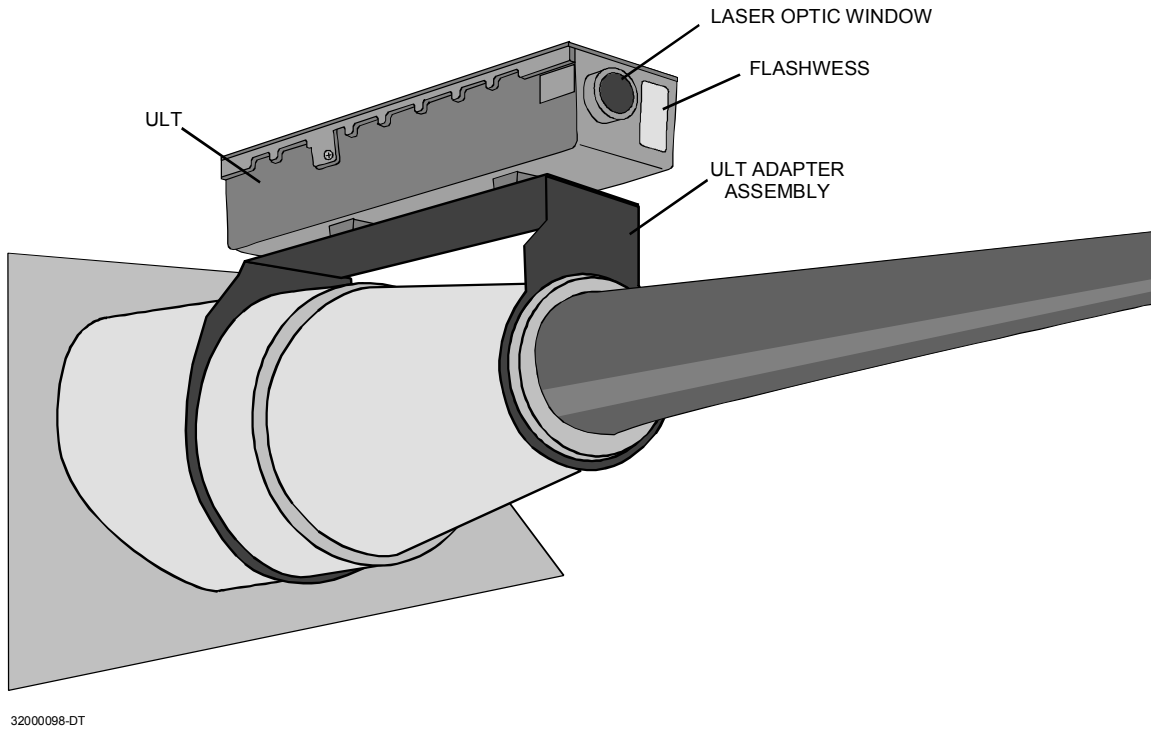


Figure 2-15. Coax Microphone.



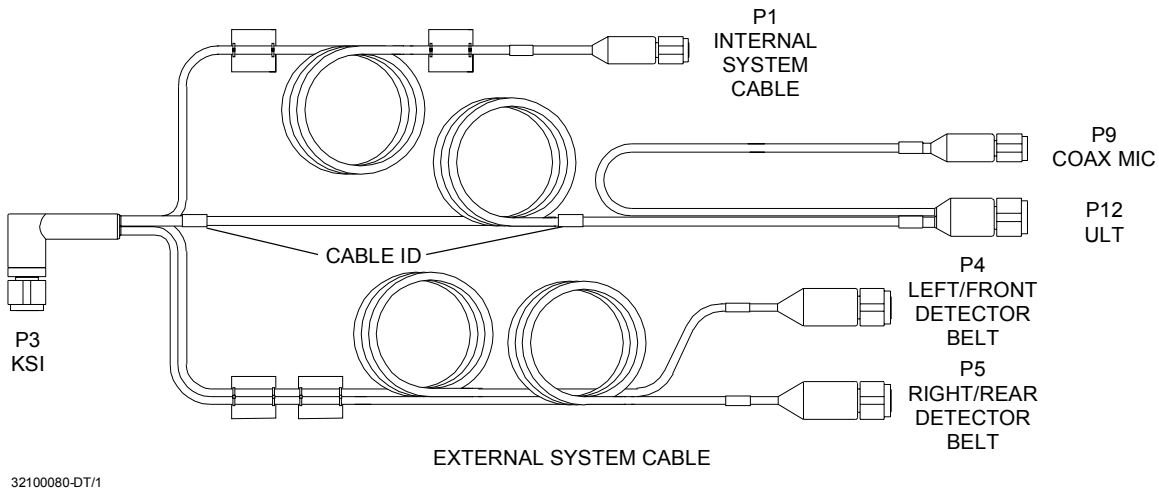
**2.3.2.5 Universal Laser Transmitter (ULT). (See Figure 2-16.)**



**Figure 2-16. ULT/Adapter Mounted on Main Gun.**

- a. Remove the ULT with the ULT adapter attached from the transit case, and inspect it for damage.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. Loosen hose clamps.
- e. Place the hose clamps over the main gun rotor extension (nose cone) with the largest clamp and the ULT connector to the rear.
- f. Adjust the ULT and adapter to ensure they are horizontally aligned with the main gun.
- g. Close and secure the hose clamps.

### 2.3.2.6 External System Cable. (See Figure 2-17.)



**Figure 2-17. External System Cable.**

#### **WARNING**

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

#### **NOTE**

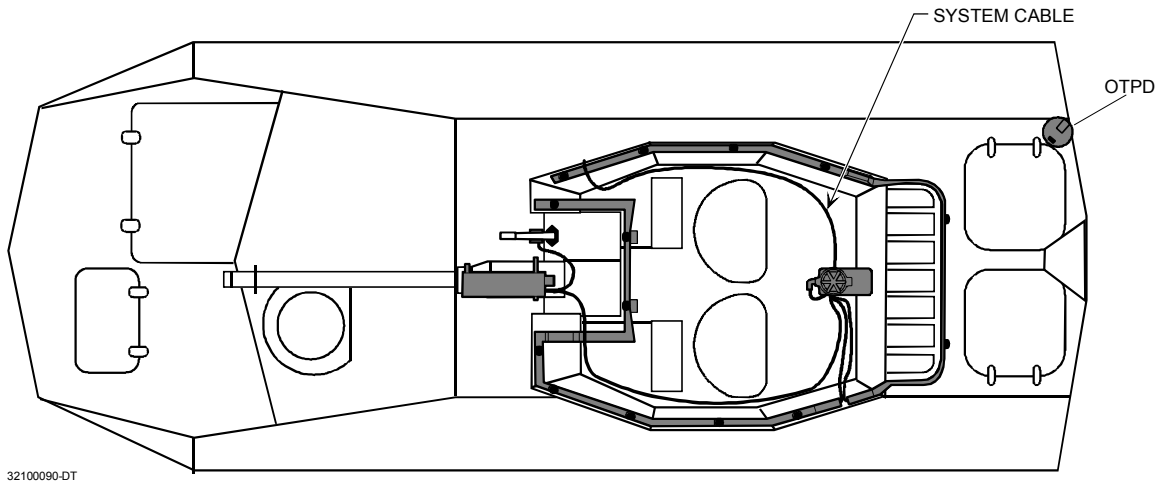
Route the cables and connect them to the individual units, using fastener tape patches or tie-wraps at intervals to secure the cables safely out of the way.

Letter/number designators are shown in parenthesis. For example: (P3) or (J1). The designators have been added to identify connectors. Each system cable segment is color coded and labeled with its unique designator, as well as with the name of the unit to which the segment should be connected.

Cable segments are labeled with “P” (plug) and “J” (jack) designators as shown in the following example: “P1/J2,” where P1 indicates that the connector of that cable segment is plug #1, and J2 indicates the routing destination, jack #2, of the equipment/cable to which the cable segment is being routed. The installation instructions of this manual identify the equipment/cable to which each cable segment is to be routed.

- Remove the cable from the transit case. Inspect the entire length of the cable, making sure there are no bare wires exposed, and the cable has not been damaged in any way.
- Inspect connectors for dirt and/or damage to pins.
- Replace and report damaged equipment, as required.

- d. Lay out the cable on top of the vehicle. (See Figure 2-18.)



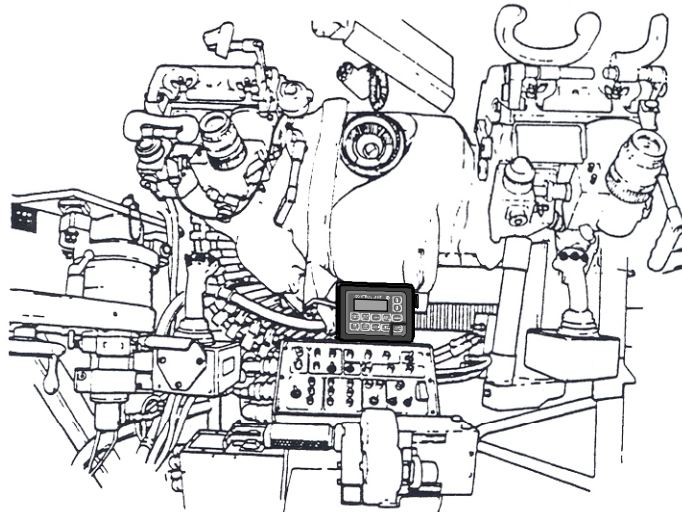
**Figure 2-18. External System Cable Routing.**

- e. Route segment (P3-green sleeve) to the KSI and attach (P3) to (J1) of the KSI.
- f. Route the detector belt cables to the Left/Rear side of the turret. Attach the connector labeled Right/Rear (P5-gray sleeve) to the Right/Rear belt connector (J1), and the cable labeled Left/Front (P4-white sleeve) to the Left/Front belt connector (J1).
- g. Route segment (P1-orange sleeve) through the 25 mm ammo ejector port or the center vision block between the commander's/gunner's hatch. This will connect to the Internal System Cable.
- h. Route segment (P9-brown sleeve) to the Coax Microphone on the coax machine gun and connect to (J1) of the Coax Microphone.
- i. Route segment (P12-blue sleeve) to the ULT on the main gun, and connect (P12) to (J1) of the ULT.
- j. Secure all cables out of the way with fastener tape patches or tie-wraps.

**2.3.2.7 Control Unit (CU).**

- a. Remove the CU from the transit case, and inspect for cracks or broken display window and membrane switch damage.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. On the bottom and back of the box, there should be two (2) strips of fastener tape. (Refer to paragraph 2.3.1.1 for fastener tape application.)
- e. Attach fastener tape to the top left of the Control Display Assembly (CDA).
- f. Mount the CU on the CDA and ensure that it is firmly seated. (See Figure 2-19.)

(Two wedges may be used to support CU in upright position.)

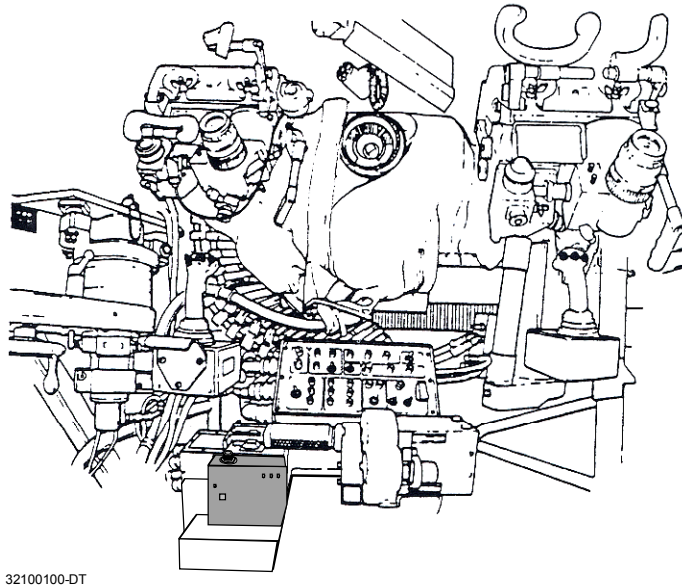


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**Figure 2-19. Control Unit (CU) Mounted.**

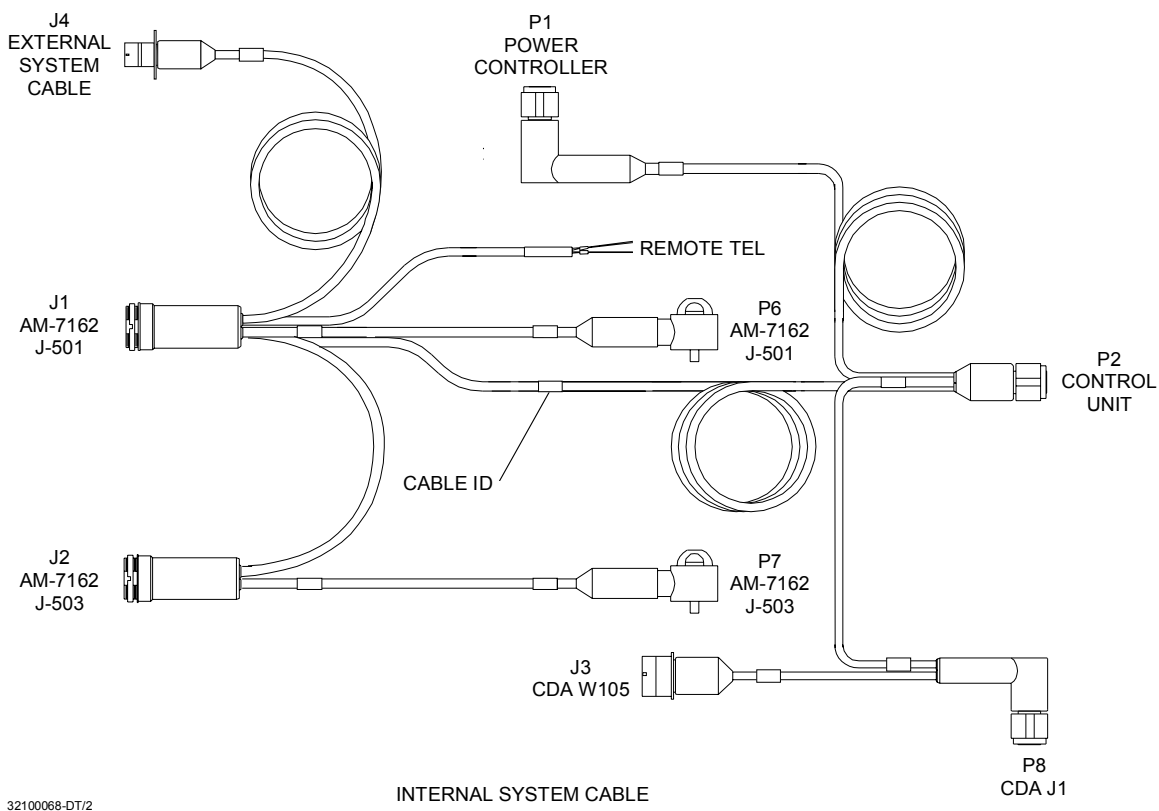
**2.3.2.8 Power Controller.**

- a. Remove the Power Controller from the transit case and inspect for damage.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. On the bottom of the box, there should be (2) two strips of fastener tape. (Refer to paragraph 2.3.1.1 for fastener tape application.)
- e. Attach fastener tape to the turret Power Distribution Assembly (PDA).
- f. Mount the Power Controller to the PDA and ensure that it is firmly seated. (See Figure 2-20.)



**Figure 2-20. Power Controller Mounted.**

### 2.3.2.9 Internal System Cable. (See Figure 2-21.)



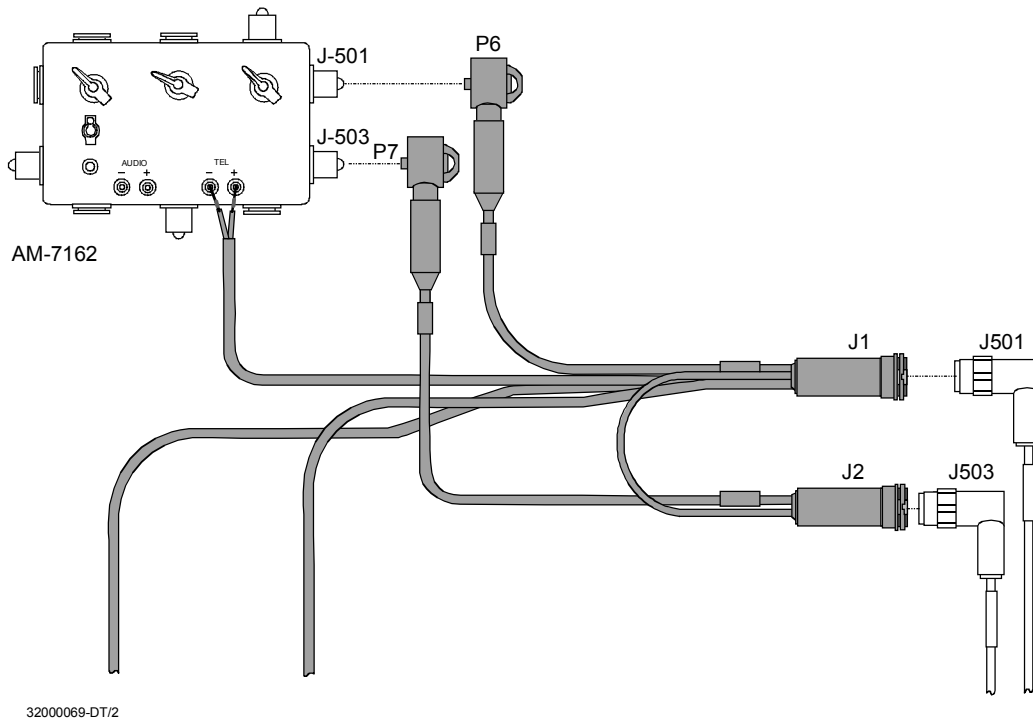
**Figure 2-21. Internal System Cable.**

#### **WARNING**

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

- Remove the cable from the transit case. Inspect the entire length of the cable, making sure there are no bare wires exposed, and the cable has not been damaged in any way.
- Inspect connectors for dirt and/or damage.
- Replace and report damaged equipment, as required.
- Bring the System Cable inside the vehicle.
- Route segment (J4-orange sleeve) to the external cable connector at the 25 mm ammo ejection port or the center vision block, and connect (J4) of the Internal System Cable to (P1) of the External System Cable.

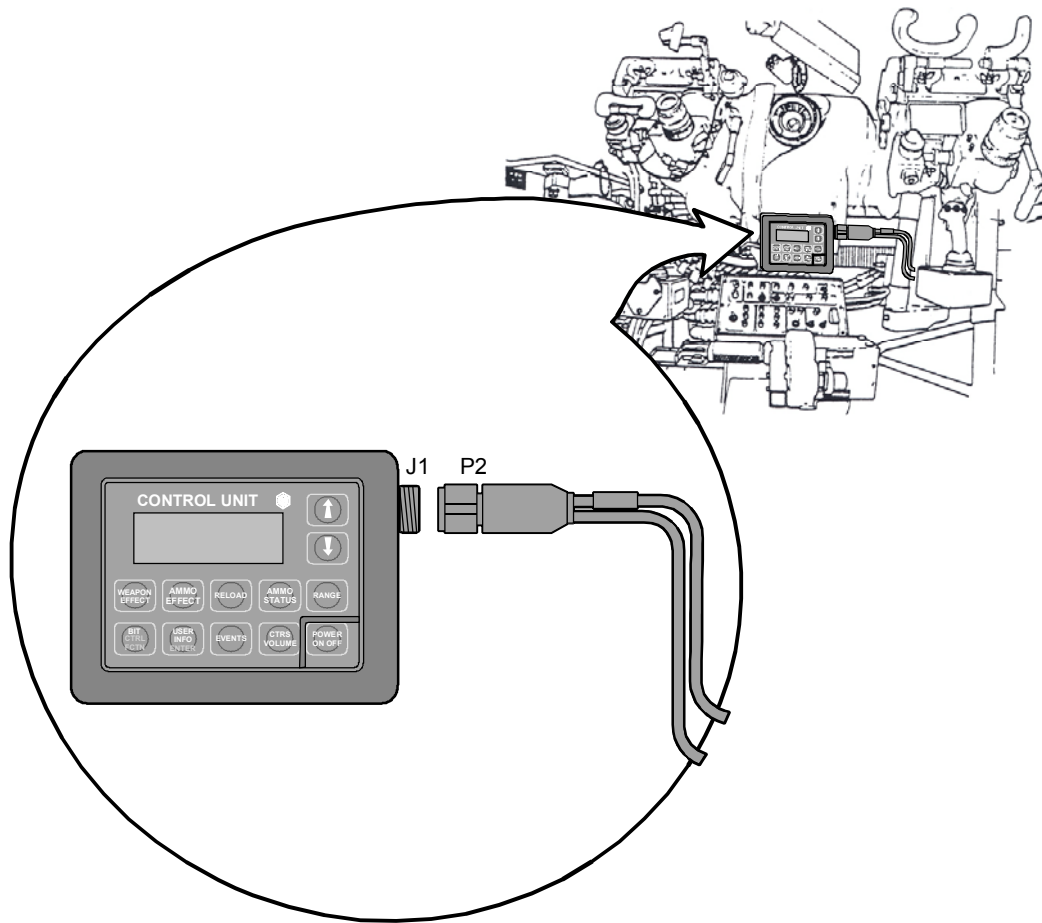
- f. Route segment (P6) and segment (J1) to the AM-7162 amplifier. Disconnect the cable connected to J501 and connect (J1) to the removed cable connector. (See Figure 2-22.)



**Figure 2-22. Cable Routing to AM-7162 Amplifier.**

- g. Route segment (P7) and segment (J2) to the AM-7162 amplifier. Disconnect the cable connected to J503 and connect (J2) to the removed cable connector. Connect (P7) to the J503 connector and connect (P6) to the J501 connector.
- h. There will be two (2) insulated wires, stripped at the ends and tinned, attached to the Internal System Cable near the segments connected to the amplifier. Connect other tinned wire to the (-) TEL/REMOTE binding post, and the other wire to the (+) TEL/REMOTE binding post on the AM-7162.

- i. Disconnect the W105 (P4, bottom) cable from the CDA. Connect the (J3) cable segment to the removed W105 cable connector. (See Figure 2-23.)



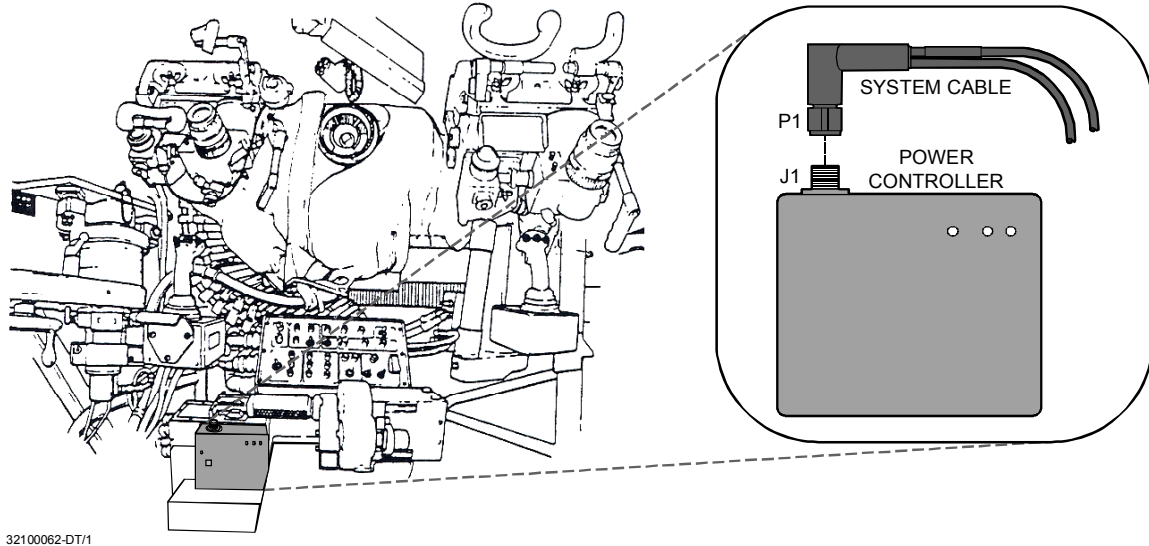
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**Figure 2-23. Control Unit Connection.**

- j. Route segment (P8) to the CDA, and connect (P8) to (J1) of the CDA.
- k. Route segment (P2-red sleeve) to the CU and connect (P2) to (J1) of the CU.



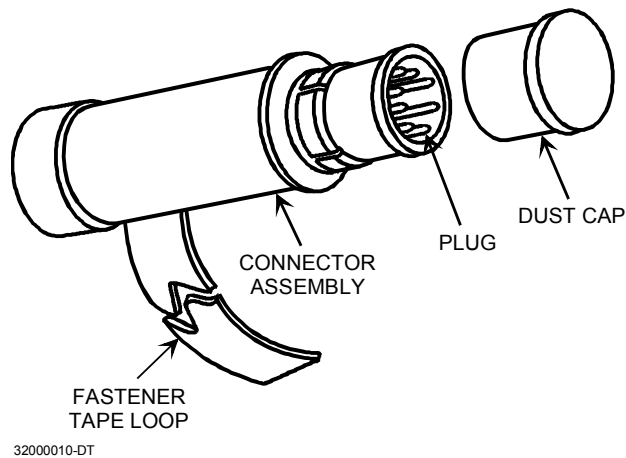
- l. Route segment (P1-violet sleeve) to the Power Controller, and connect (P1) to (J1) of the Power Controller. (See Figure 2-24.)
- m. Secure all cables out of the way with fastener tape patches or tie-wraps.



**Figure 2-24. Power Controller Connection.**

### **2.3.2.10 Shorting Plug.**

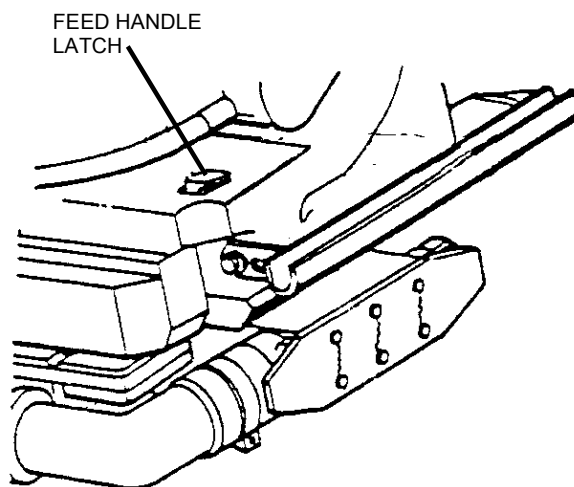
- a. Inspect connector assembly (Figure 2-25) for damage.



**Figure 2-25. Shorting Plug Installation.**

- b. Remove dust cap and inspect plug for dirt, and bent or damaged pins.
- c. Replace and report damaged equipment, as required.

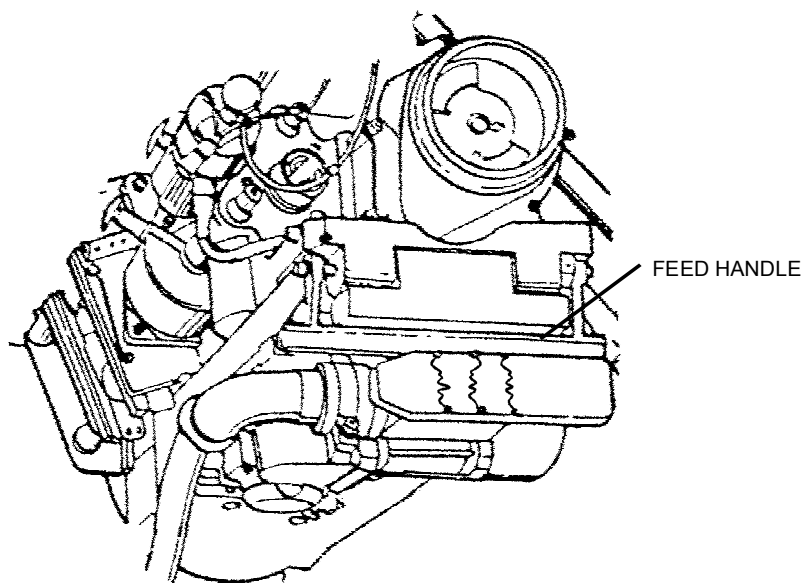
- d. Press Feeder Handle Latch (Figure 2-26) on main gun receiver.



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**Figure 2-26. Main Gun Receiver Feeder Handle Latch.**

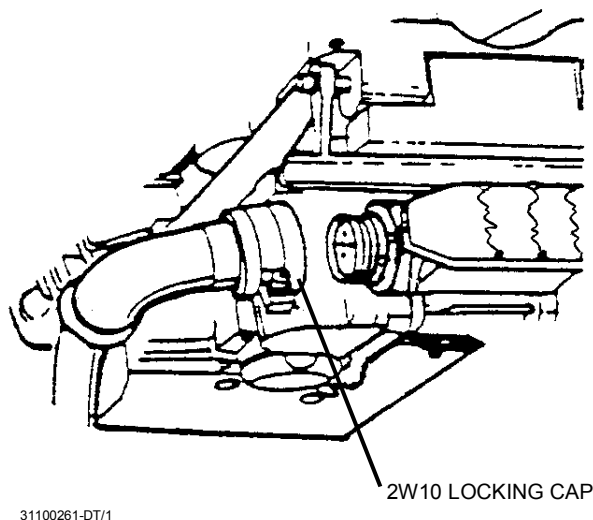
- e. Lift Feeder Handle up on main gun receiver. (See Figure 2-27.)



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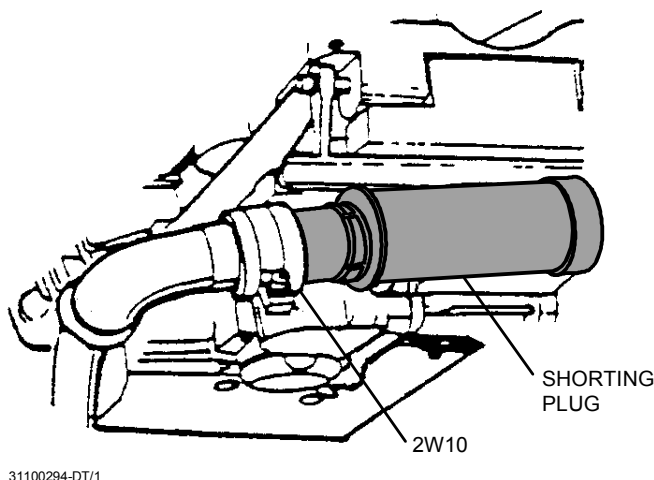
**Figure 2-27. Main Gun Receiver Feeder Handle.**

- f. Rotate locking cap on cable W104P2 counterclockwise. Disconnect connector from electrical receptacle on main gun receiver. (See Figure 2-28.)



**Figure 2-28. Main Gun Receiver 2W10 Locking Cap.**

- g. Connect shorting plug to cable W104P2. (See Figure 2-29.)



**Figure 2-29. Main Gun Receiver 2W10 with Shorting Plug Connected.**

**NOTE**

**DO NOT** connect the shorting plug to the main gun receiver, as it will cause errors when the MILES system is brought on-line.

- h. Push shorting plug into connector, and twist the connector ring clockwise to make connection.

**NOTE**

**DO NOT** twist gun cable when installing or removing shorting plug.

- i. Using fastener tape loop (Figure 2-25), place cable underneath gun mount. Secure cable and shorting plug out of the way, so that it will not interfere with or be damaged by movement of the gun.

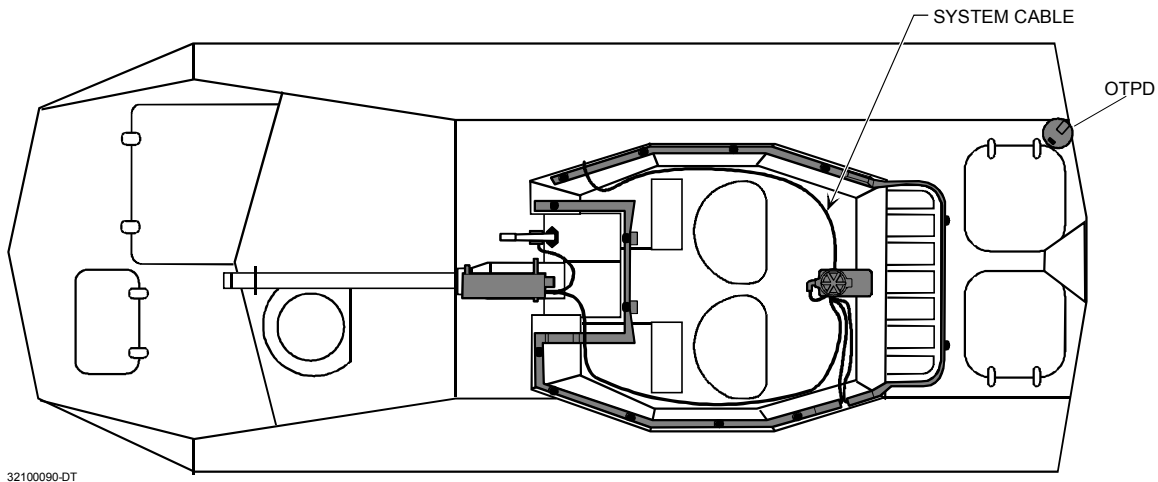
### **2.3.2.11 Optical Turret Positioning Device (OTPD).**

- a. Remove the OTPD from the transit case, and inspect for cracks in lenses.
- b. Replace and report damaged equipment, as required.
- c. Check to make sure a battery is installed in the OTPD. If there is no battery, or if the battery is bad, loosen the thumbscrew on the battery cover, open the cover, remove the bad battery (if there is one in place), and install a 9-volt battery. Secure the battery door by tightening the thumbscrew.

#### **CAUTION**

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.

- d. Position the OTPD to the Right/Rear corner of the hull, so the infrared window is aimed at the detectors on the turret as shown in Figure 2-30. Secure the lanyard to the Right/Rear lifting point.

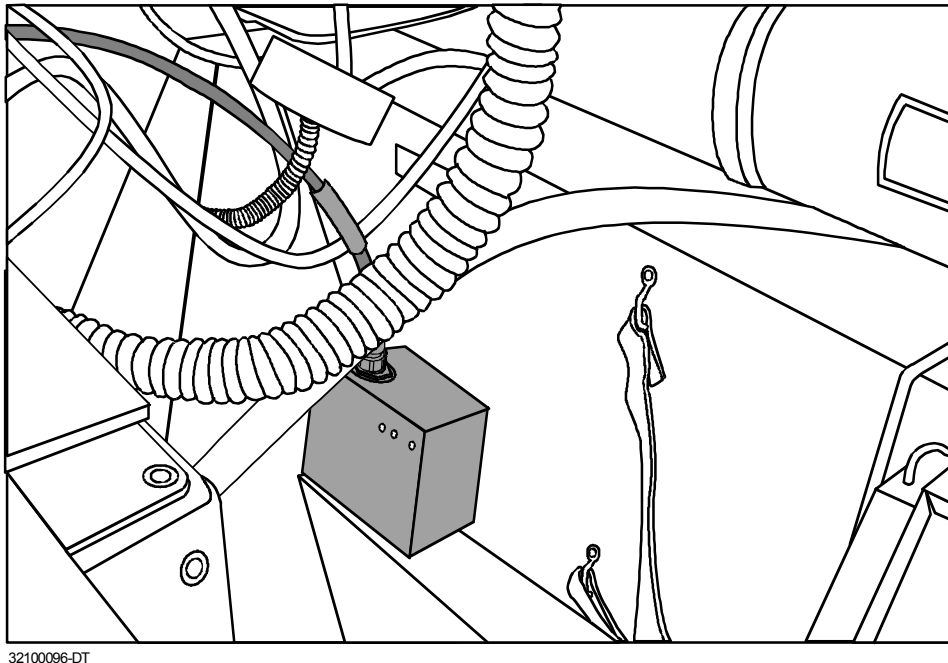


**Figure 2-30. OTPD Mounting.**

- e. Power up the system and BIT runs automatically. (Refer to paragraph 2-8.) If BIT fails, reposition the OTPD and rerun BIT. (Do this until BIT passes.) When BIT passes, mark the position of the OTPD on the vehicle's hull.
- f. Apply primer and fastener tape to the Right/Rear corner of the hull behind the turret. Mount the OTPD on the hull and ensure it is firmly seated. (Refer to paragraph 2.3.1.1 for fastener tape preparation.)

**2.3.2.12 Power Controller.**

- a. Remove the Power Controller from the transit case, and inspect for damage.
- b. Inspect connector for dirt and/or damage.
- c. Replace and report damaged equipment, as required.
- d. On the bottom of the box, there should be two (2) strips of fastener tape. (Refer to paragraph 2.3.1.1 for fastener tape application.)
- e. Attach fastener tape to the lower shelf behind the dismounted TOW tripod storage area.
- f. Mount the Power Controller to the vehicle, and ensure that it is firmly seated. (See Figure 2-31.)



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**Figure 2-31. Power Controller.**

**2.4 INITIAL ADJUSTMENTS, BEFORE USE, DAILY CHECKS, AND SELF-TEST REQUIREMENTS.**

Before operating MILES 2000 equipment, perform the following:

- a. Ensure Preventive Maintenance Checks and Services (PMCS) described in Section II have been performed.
- b. Perform the Functional Checks described in Section V.

**2.5 OPERATING PROCEDURES.****NOTE**

Ensure that the Power Controller is fully charged. A Power Controller near discharge will cause either BIT to continuously cycle when the system is powered up, or cause the system to continuously reset. Should this occur, turn the Control Unit off, start the vehicle, and allow the Power Controller to recharge for 15 minutes or replace the Power Controller.

**2.5.1 Control Mode On Operating Procedures.** (Refer to Table 2-3.) Upon power up, the control unit will come up with a vehicle status of "CHEAT KILL," and the KSI will flash continuously. The Controller can reset the vehicle status by setting the CD/TDTD (Controller Gun) for "reset," and firing at a detector on the vehicle. The KSI will flash once and the vehicle intercom will sound with "reset." The vehicle may be made mission ready in one of two ways: 1) the Controller can set up information for the vehicle and weapons type on the MARS computer, and upload the information to the CD/TDTD (Controller Gun), then upload the information to the vehicle via the optical port on the KSI; or 2) the Controller can set the vehicle status to "Control Mode On," and the required information can be set from the CU.

**Table 2-3. Control Mode ON.**

**This is an aid to help you make the proper selections.**

HOST PLATFORM	VEHICLE SIMULATED	WESS SELECTION
LAV-25	LAV-25	COAX BLANK FIRE DRYFIRE

- a. Turn on the CU. MILES 2000 equipment should power up and automatically run BIT. Upon completion of BIT, the vehicle intercom will sound with, “**Audio Check**,” and indicate whether BIT passed or failed.

**NOTE**

During BIT, “Switch Test” will be displayed on the CU. Verify push buttons are working correctly.

- b. After the power on BIT completes, the system will be in a “killed” state, and will display “CHEAT KILL POWER SOURCE TAMPER” for approximately 7 seconds. The KSI will be flashing continuously. Using the CD/TDTD (Controller Gun), reset the system.
- c. Have the Controller Time Sync the system using a CD/TDTD (Controller Gun). Aim at any detector and pull the trigger. The KSI will flash twice.

**NOTE**

Use a CD/TDTD (Controller Gun) that has been Time Synchronized by another CD/TDTD (Controller Gun). This ensures that all the exercise units and CD/TDTDs (Controller Gun) have the same date and time.

- d. Set the CD/TDTD (Controller Gun) to Clear Events, and place the CD/TDTD (Controller Gun) into the Kill Status Indicator (KSI) Optical Port and pull the trigger.
- e. Press the EVENTS push button on the CU to verify that it has been cleared.
- f. Time Sync the system again using a CD/TDTD (Controller Gun). Aim at any detector and pull the trigger. KSI will flash twice.
- g. Change the vehicle status to “Control Mode On” by setting the CD/TDTD (Controller Gun) accordingly. Aim at a detector, and pull the trigger.
- h. The KSI will flash once, the CU should display, and the vehicle intercom will sound with:

**CONTROL MODE ON  
(LIMIT 5 MINUTES)**

**NOTE**

Pressing any push buttons other than the following four will shut Control Mode Off: Up Arrow, Down Arrow, CTRL/FCTN (red label), and the Enter (red label) push buttons.

- i. With a vehicle status of “Control Mode On,” perform the following actions:
  - (1) Press the BIT/CTRL FCTN push button on the CU.
  - (2) The CU will display the main menu:

**HOST PLATFORM  
VEHICLE SIMULATED  
WESS SELECTIONS**

- (3) Move the cursor to “HOST PLATFORM” and press ENTER. The CU will display a list of vehicles.
- (4) Move the cursor to your vehicle selection and press ENTER.
- (5) The CU will display:

**HOST PLATFORM  
VEHICLE SIMULATED  
WESS SELECTIONS**

- (6) Move the cursor to “VEHICLE SIMULATED” and press ENTER.
- (7) The CU will display:

**DEFAULT VEHICLES  
CUSTOM VEHICLES**

- (8) Move the cursor to “DEFAULT VEHICLE” and press ENTER. The CU will display a list of vehicles.
- (9) Move the cursor to your vehicle selection and press ENTER.
- (10) The CU will display:

**AMMO & RATE CONTROL  
KEYBOARD SELECT  
VEHICLE SELECT**

- (11) Move the cursor to “VEHICLE SELECT” and press ENTER. The CU will display the Threshold screen.
- (12) The CU will display a default threshold of 125.

**USE ARROW KEYS TO  
ADJUST MOTION  
THRESHHOLD: 125  
<ENTER WHEN DONE>**

Press ENTER.

**NOTE**

Should the vehicle assess a Cheat Kill after a Mobility Kill due to crew movement, turret movement, engine vibration, etc., ask the Controller to increase the vehicle’s threshold level.



- (13) The CU will display:

**HOST PLATFORM  
VEHICLE SIMULATED  
WESS SELECTIONS**

- (14) Move the cursor to “HOST PLATFORM” and press ENTER. The CU will display a list of vehicles.
- (15) Move the cursor to your vehicle selection LAV-25 02 and press ENTER.
- (16) The CU returns to the main menu and will display:

**HOST PLATFORM  
VEHICLE SIMULATED  
WESS SELECTIONS**

- (17) Move the cursor to “VEHICLE SIMULATED” and press ENTER.
- (18) The CU will display:

**DEFAULT VEHICLES  
CUSTOM VEHICLES**

- (19) Move the cursor to “DEFAULT VEHICLE” and press ENTER. The CU will display a list of vehicles.
- (20) Move the cursor to you vehicle selection (LAV-25 19) and press ENTER.
- (21) The CU will display:

**USE ARROW KEYS TO  
ADJUST MOTION  
THRESHOLD: 125  
<ENTER WHEN DONE>**

- (22) The CU will display a default threshold of 125. Press Enter.

**NOTE**

Should the vehicle be assessed a Cheat Kill, after a Mobility Kill, due to crew movement, turret movement, engine vibration, etc., ask the Controller to increase the vehicle’s threshold level.

- (23) The CU returns to the main menu and will display:

**HOST PLATFORM  
VEHICLE SIMULATED  
WESS SELECTIONS**

- (24) Move the cursor on WESS SELECTION, press ENTER. The CU will display the weapons for the vehicle you have selected. (Refer to Table 2-3 for WESS selection options.)

**NOTE**

The WESS selection screen will display the previous WESS selections.

- (a) WESS selection for the LAV-25 is as follows:

**MAIN GUN – NO WESS**  
**COAX – BLANK FIRE**

- (b) Select “Main Gun - NO WESS” and press ENTER. The CU will display:

**MAIN GUN – WESS**  
**FLASHWESS**  
**AWESS**  
**NO WESS**

- (c) Select FLASHWESS and press ENTER. The CU will return to the WESS SELECTION screen.

**MAIN GUN – FLASHWESS**  
**COAX – BLANK FIRE**

- (d) Select “COAX” and press ENTER. The CU will display:

**COAX WESS**  
**BLANKFIRE**  
**DRYFIRE**

- (e) Select “BLANKFIRE” and press ENTER. This returns you to the main menu.

**HOST PLATFORM**  
**VEHICLE SIMULATED**  
**WESS SELECTION**

- (25) Press the WEAPON SELECT push button on the CU. The KSI will flash once, and the vehicle intercom will sound with “Control Mode Off.” The CU will display:

**CONTROL MODE OFF**

**2.5.2 LAV Loading/Firing Procedures.**

**NOTE**

The Coax Machine gun may be fired at any time. You do not have to select it to fire it. Fire weapon using normal procedures.

When MILES 2000 is installed on the LAV-25, the low ammo sensors must be covered prior to firing the main gun.

- a. Press the WEAPON SELECT push button on the CU. The CU displays:

**MAIN 1**  
**MAIN 2**  
**USE ENTER TO SELECT**

- b. Move the cursor to the "MAIN 1" (or "MAIN 2") and press ENTER.

**LAV-25**  
**MAIN GUN – 210**  
**COAX – BLANKS**

- c. Press the AMMO SELECT push button.

- d. The CU should display:

**APDS 60**  
**HEAT 150**

- e. Move the cursor to your ammo selection and press ENTER.

- f. Press the RELOAD push button.

- g. The CU may display (depending on the ammo you have selected):

--- **MAIN 1**      **–APDS –** ---  
      **00050**      **ROUNDS**  
 -----

#### NOTE

When firing the main gun, the CU will display one of the following:

HEAT      SS, LO, or HI  
 APDS      SS, LO, or HI

Where SS=single shot, LO=100 rounds/minute, and HI=200 rounds/minute.

- h. Press the push button on the CU.

**WEAPONS SELECT**

- i. To load the other feeder ("MAIN 2"), use the above procedure.
- j. Fire the main gun.

### **2.5.3 Console Display at Night or Limited Visibility.**

- a. Press either of the Arrow push buttons on the CU. This will light the display for 3 seconds.
- b. Make your selection. Once a push button is pressed, the display will stay lighted for 7.5 seconds, (or for 7.5 seconds after the last push button has been pressed.)
- c. After the last push button is pressed, and 7.5 seconds has elapsed, the display will return to the default screen. The display will then stay lighted for another 3 seconds.
- d. When BIT is run (from power on, or initiated by the user), the display will stay lit during BIT.

**2.5.4 LAV-25 Boresight Procedures.** After completion of installation of MILES equipment, you must perform the boresight procedures prior to firing the LAV-25's weapons.

- a. Turn vehicle Master Power and Turret Power on.
- b. Turn on the Thermal Sight.
- c. Set turret for manual operation.
- d. Ensure the MILES 2000 system is initialized (para. 2.5.1), and loaded (para. 2.5.2.1), in accordance with the MILES 2000 System Manual.
- e. Pick an easily identifiable distant point target at a range of  $1200 \pm 50$  meters. Use the traverse and elevation handwheels to lay the gunner's daysight battlesight circle on the target.
- f. Remove the cover from the back of the ULT. Sight through the ULT scope, and use the adjustment knobs to move the scope crosshair to the same point target the vehicle battlesight circle is on.
- g. Ensure that the vehicle battlesight circle remains on the point target while the ULT is being adjusted.
- h. Place a MILES 2000 equipped target at a range of  $1200 \pm 50$  meters. If these ranges are not available, place the target as far away as possible.
- i. Select AP single shot and use the handwheels to lay the gunner's daysight battlesight circle onto the center of mass of the MILES 2000 target; fire one round. A Hit, Kill, or Near Miss should be registered at the target.
- j. Use the handwheels to move the aim-point up (use small increments); fire a round at each new aim-point. You want to find the highest aim-point at which a Kill or Hit is registered on the target. Depending on the range and the target, the highest aim-point may be above the target. (Mentally note where this aim-point is.)
- k. Use the handwheels to move the aim-point to the center of mass of the target.
- l. Use the handwheels to move the aim-point down (use small increments); fire a round at each new aim-point. You want to find the lowest aim-point at which a Kill or Hit is registered on the target. Depending on the range and the target, the lowest aim-point may be below the target. (Mentally note where this aim-point is.)
- m. Use the handwheels to move the aim-point to the center of the Kill/Hit zone.

**NOTE**

The Kill/Hit zone is not the center of the target, but midway between the highest and lowest aim-points that were killed/hit.

- n. Without moving the handwheels or the ULT, use the daysight reticle vertical adjustment to center the battlesight circle on the center of the mass of the target; fire one round, and verify that a Kill or Hit is registered on the target.
- o. Use the handwheels to move the aim-point right (use small increments); fire a round at each new aim-point. You want to find the aim-point farthest to the right at which a Kill or Hit is registered on the target. Depending on the range and the target, this aim-point may be to the right of the target.

**(Mentally note where this aim-point is.)**

- p. Use the handwheels to move the aim-point to the center of mass of the target.
- q. Use the handwheels to move the aim point left; fire a round at each new aim-point. You want to find the farthest aim-point to the left at which a Kill or Hit is registered on the target. Depending on the range and the target, this aim-point may be to the left of the target.

**(Mentally note where this aim-point is.)**

- r. Use the handwheels to move the aim-point to the center of the Kill/Hit zone.

**NOTE**

The Kill/Hit zone is not the center of the target, but midway between the farthest right and left aim-points that were killed/hit.

- s. Without moving the handwheels or the ULT, use the daysight reticle vertical adjustment to center the battlesight circle on the center mass of the target; fire one round and verify that a Kill or Hit is registered on the target.
- t. Repeat steps j. through l., and o. through q. to verify that the kill zone is now centered on the target.
- u. Replace the cover on the ULT.
- v. Use the commander's sight reticle adjustments to move his battlesight circle to the same aim-point as the gunner's battlesight circle.
- w. Use the thermal sights reticle adjustments to move the thermal sights battlesight circle to the same aim-point as the gunner's battlesight circle.
- x. To check the boresight, place the turret in power mode, and use the power control handles to move the aim-point in a "G" pattern ending back on the target. Fire at the target using the power control handles, and ensure that the target is still centered in the kill zone.

## SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

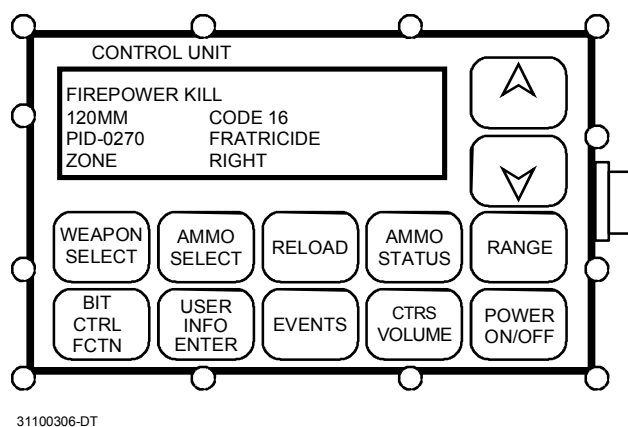
### 2.6 ASSEMBLY AND PREPARATION FOR USE UNDER UNUSUAL CONDITIONS.

**2.6.1 Unusual Environment/Weather.** MILES 2000 equipment is ruggedized to withstand extreme changes in temperature, terrain, and environment. Therefore, assembly and preparation in unusual environment/weather should only require the caution necessary to ensure the safety of the operators and other participants.

**2.6.2 Fording and Swimming.** MILES 2000 equipment is waterproof and ruggedized. Therefore, equipment transport which requires fording and/or swimming should only require caution necessary to safeguard operators and participants, and to maintain control and accountability of the equipment.

**2.6.3 Emergency Procedures.** MILES 2000 equipment requires no additional procedures for emergency situations, as the equipment has been developed to be used for training simulations encompassing a great variety of conditions and levels of threat.

**2.6.4 Communications Override Procedures.** In the event of a Catastrophic or Communication Kill, the external communications can be over-riden for emergencies. (See Figure 2-32.)



**Figure 2-32. Control Unit (CU).**

Press the USER INFO/ENTER push button. The CU will display:

XXXX	YYMMDD	HHMMSS	XXXX	= PID
□ COMMO		– DISABLED	YYMMDD	= DATE
			HHMMSS	= TIME

Press the USER INFO/ENTER push button (toggle) to Enable. The CU will display:

XXXX	YYMMDD	HHMMSS
□ COMMO		– ENABLED

## **SECTION V. FUNCTIONAL CHECKS**

### **2.7 FUNCTIONAL CHECKS.**

The functional check for MILES 2000 equipment is accomplished by the BIT performed by the CU. The CU will run the BIT, and the CU display screen will stay lighted during the test. Once the test has been run, the CU will display the results on the screen. Table 3-1, Chapter 3, Section I, Troubleshooting contains the list of possible error messages the CU may display with MILES 2000 equipment.

### **2.8 BUILT-IN-TEST (BIT).**

To run the vehicle system BIT, perform the steps in Table 2-4.

Table 2-4. Built-In-Test (BIT).

ACTION	INDICATION
<p>Turn Control Unit (CU) ON.</p> <p>“SWITCH TEST” will be displayed on the CU.</p> <p>Press the “WEAPON SELECT” push button on the CU.</p> <p>Press the “AMMO SELECT” push button on the CU.</p> <p>Continue to do the switch test until you are satisfied that the push buttons are working properly.</p> <p>To continue the BIT, simply stop pressing push buttons.</p> <p>Read results of BIT.</p> <p>Reset vehicle with the CD/TDTD (Controller Gun).</p>	<p>CU display should light and stay lighted throughout the test.</p> <p>MILES 2000 equipment should power up.</p> <p>Vehicle intercom sounds with: “Audio Check,” then indicates BIT pass or failure. The KSI will flash continuously.</p> <p>CU will automatically begin the BIT.</p> <p>User may now test push buttons on CU to ensure the push buttons are working properly.</p> <p>The display should read “WEAPON SELECT.”</p> <p>The display should read “AMMO SELECT.”</p> <p>The display should match the label of the push button being pressed. Arrow push buttons should read “UP” or “DOWN.”</p> <p>The unit will automatically continue the BIT without further command.</p> <p>The display will indicate the following:</p> <p><b>BIT PASSED</b> - Indicates an operational system.</p> <p>or</p> <p><b>BIT FAIL (with error message)</b> - All or part of the equipment has failed the BIT or equipment is missing or not properly connected. Refer to Chapter 3, Section 1, Table 3-1 for further action.</p> <p>then</p> <p>“CHEAT KILL POWER SOURCE TAMPER.”</p> <p>then</p> <p><b>KILLED</b> - The equipment has suffered a Catastrophic Kill. Contact the Controller.</p> <p>after reset</p> <p><b>READY</b> - The equipment has passed the BIT and the mission may be continued.</p>



## **CHAPTER 3**

### **OPERATOR MAINTENANCE INSTRUCTIONS**

#### **SECTION I. TROUBLESHOOTING**

##### **3.1 TROUBLESHOOTING PROCEDURES.**

Following are troubleshooting procedures for problems which may be encountered with the MILES 2000 LAV configurations. Operator troubleshooting procedures involve identifying a problem and isolating the problem to the most likely piece(s) of equipment. Generally the BIT run by the CU identifies most problems within the system, and produces an error message to let the user know that there is a problem. Table 3-1 lists the error messages that are available; the MILES 2000 equipment malfunction most likely to cause the error message; and the appropriate action to take to correct the problem. You may notice that much of the time, the corrective action to be taken to resolve a problem is to remove the malfunctioning equipment and replace it with a unit that is working. This is because the MILES 2000 equipment is designed to need only limited maintenance at the operator and/or unit level. When the removal and replacement of equipment can be efficiently expedited, "downtime" can be cut dramatically, and participants can quickly return to the mission scenario, allowing them to receive maximum benefit from training. Removal and replacement procedures are located in this chapter in Section II, Operator Maintenance.

##### **WARNING**

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

You may encounter equipment problems not addressed in this section. If this is the case, notify the appropriate personnel (a supervisor and/or higher echelon maintenance personnel) as soon as possible.

**Table 3-1. MILES 2000 Troubleshooting Chart for LAV Configurations.**

<b>PROBLEM</b>	<b>PROBABLE CAUSE(S)</b>	<b>ACTION</b>
No power to MILES 2000 - No LEDs lighted on Power Controller.	<p>Connection from system cable not secure or connectors damaged.</p> <p>Power Controller</p> <p>System Cable</p>	<p>Check system cable connection at Power Controller. Tighten if loose. Ensure connector is not damaged, and that there is no debris or foreign objects in connector.</p> <p>Check System Cable connection to vehicle slave receptacle. Tighten if loose. Ensure connector is not damaged, and that there is no debris or foreign objects in connector.</p> <p>Check Power Controller. If no LEDs lighted, remove and replace power controller.</p> <p>If problem still exists, remove and replace system cable.</p> <p>If problem still exists, refer problem to higher echelon maintenance.</p>
BATTERY POWER LOW LED lighted on Power Controller.	Batteries not fully charged.	Remove and replace Power Controller.
<b>BIT FAILURE</b>	<b>PROBABLE CAUSE(S)</b>	<b>ACTION</b>
Control Unit (CU) memory	CU	Remove and replace.
CU	CU	Remove and replace.
CU voice	CU	Remove and replace.
CU display	CU	Remove and replace.
No Universal Laser Transmitter (ULT) commo	ULT	<p>Check connections.</p> <p>Retest.</p> <p>If error is repeated, remove and replace.</p>
ULT EPROM	ULT	Remove and replace.
ULT memory	ULT	Remove and replace.
ULT laser	ULT	Remove and replace.
ULT COAX no blank	ULT	Load blanks.

**Table 3-1. MILES 2000 Troubleshooting Chart for LAV Configurations – Continued.**

<b>PROBLEM</b>	<b>PROBABLE CAUSE(S)</b>	<b>ACTION</b>
No Kill Status Indicator (KSI) commo	KSI	Check connections.  Retest.  If error is repeated, remove and replace.
KSI Memory	KSI	Remove and replace.
Strobe	KSI	Check connections.  Retest.  If error is repeated, remove and replace.
Optical Turret Positioning Device (OTPD) Battery Low	OTPD	Replace battery with standard 9-volt battery.  Retest.  If error is repeated, remove and replace.
No OTPD data	OTPD	Check position of OTPD to ensure it is properly placed.  Retest.  If error is repeated, replace the OTPD battery with a standard 9-volt battery.  Retest.  If error is repeated, remove and replace.
Belts/AMPL noisy	Detector belts	Replace amplifier on one detector belt.  Retest.  If error repeats, replace amplifier on each belt until the error no longer repeats.  OR, remove and replace belts.

**Table 3-1. MILES 2000 Troubleshooting Chart for LAV Configurations – Continued.**

<b>PROBLEM</b>	<b>PROBABLE CAUSE(S)</b>	<b>ACTION</b>
Front belt	Detector belts	Remove and replace Left/Front de- tector belt.
Rear belt	Detector belts	Remove and replace Right/Rear detector belt.
Left belt	Detector belts	Remove and replace Left/Front de- tector belt.
Right belt	Detector belts	Remove and replace Right/Rear detector belt.

## SECTION II. OPERATOR MAINTENANCE

### **3.2 OPERATOR MAINTENANCE PROCEDURES.**

Much of the operator maintenance for the MILES 2000 equipment consists of removing the defective item and replacing it with functioning equipment. Remove/Replace procedures for all LAV configurations are included in the following paragraphs:

#### **WARNING**

To prevent personal injury, turn all system power off, including the CU, before conducting any removal/replacement procedures.

#### **3.2.1 Removal/Replacement Procedures for All LAVs.**

##### **NOTE**

Cleaning of MILES 2000 equipment requires no special procedures or the use of cleaning compounds/chemicals. Clean all areas, including the lens area by: (1) wiping dirt and dust away using a soft rag; (2) clean with a soft cloth rag dampened with water; and (3) polish to a brilliant luster with a finishing cloth. **The use of chemicals to clean MILES equipment, including the cleaning of lenses, is not recommended.**

#### **3.2.1.1 M240 Small Arms Transmitter Removal.**

- a. Detach the SAT adapter from the barrel of the pintle-mounted M240 machine gun.
- b. Remove the SAT and adapter from the gun barrel, taking care not to damage the equipment.
- c. Clean the equipment and adapter, and prepare for turn in.

#### **3.2.1.2 M240 Small Arms Transmitter Replacement.**

- a. Inspect the mounting adapter. Make sure the SAT is securely mounted to the adapter.
- b. Slide the SAT/adapter over the barrel of the pintle-mounted M240, and secure the adapter to the barrel.
- c. Torque to 60 inch-pounds.

#### **3.2.1.3 Left/Front Detector Belt Removal.**

- a. Disconnect the External System Cable from the detector belt connector.
- b. Working with short sections, detach the detector belt from the fastener tape on the vehicle. Work carefully so that no electronics or wiring are damaged during removal.
- c. Clean equipment and prepare for turn in.

**3.2.1.4 Left/Front Detector Belt Replacement.**

- a. Working in short sections, press the detector belt against the fastener tape. Work carefully so that no electronics or wiring are damaged during replacement.
- b. Once the belt is installed, attach the External System Cable connector to the belt connector.
- c. Safely secure cable by using fastener tape patches or tie-wraps.

**3.2.1.5 Right/Rear Detector Belt Removal.**

- a. Disconnect the External System Cable from the detector belt connector.
- b. Working with short sections, detach the detector belt from the fastener tape on the vehicle. Work carefully so that no electronics or wiring are damaged during removal.
- c. Clean equipment and prepare for turn in.

**3.2.1.6 Right/Rear Detector Belt Replacement.**

- a. Working in short sections, press the detector belt against the fastener tape. Work carefully so that no electronics or wiring are damaged during replacement.
- b. Once the belt is installed, attach the External System Cable connector to the belt connector.
- c. Safely secure the cable using fastener tape patches or tie-wraps.

**3.2.1.7 Kill Status Indicator (KSI) Removal.**

- a. Disconnect the External System Cable from the KSI connector.
- b. Disengage the rubber latches on the upper mounting adapter from the latching brackets on the KSI.
- c. Pull the KSI away from the mounting adapter, taking care not to damage the equipment.
- d. Clean equipment and prepare for turn in.

**3.2.1.8 Kill Status Indicator Replacement.**

- a. Apply fastener tape to the KSI, if needed.
- b. Match the KSI latching brackets to the upper mounting adapter latch positions, and secure the KSI to the adapter with the fastener tape patches or tie-wraps.
- c. Secure the rubber latches from the mounting adapter to the latching brackets on the KSI.
- d. Connect the System Cable to the KSI.

**3.2.1.9 Coax Microphone Removal.**

- a. Disconnect the System Cable from the Coax Mic.
- b. Unclip the Coax Mic from the gas tube beneath the machine gun barrel, taking care not to damage the equipment.
- c. Detach fastener tape patches or tie-wraps securing Coax Mic cable to the vehicle, and remove the cable and Coax Mic.
- d. Clean the equipment and prepare for turn in.

**3.2.1.10 Coax Microphone Replacement.**

- a. Clip the Coax Mic to the gas tube beneath the machine gun barrel. Ensure the Coax Mic cable is not in contact with the barrel.
- b. Connect the System Cable to the Coax Mic.
- c. Secure the cable out of the way, as needed.

**3.2.1.11 Universal Laser Transmitter Removal.**

- a. Disconnect the System Cable from the ULT.
- b. Unscrew the bolts from the adapter rings, and open the rings.
- c. Remove the ULT and adapter from the main gun rotor extension (nose cone).
- d. Clean the equipment and prepare for turn in.

**3.2.1.12 Universal Laser Transmitter Replacement.**

- a. Remove the bolts from the adapter rings and open the rings.
- b. Place the ULT and adapter over the main gun rotor extension (nose cone). (It is the largest ring of the adapter to the rear.)
- c. Close the rings, and secure with the bolts.
- d. Adjust the ULT and adapter, as needed for proper sighting.
- e. Connect the system cable to the ULT.

**3.2.1.13 Control Unit Removal.**

- a. Disconnect the System Cable from the CU.
- b. Detach the CU from the vehicle (for the LAV-25, from the top of the CDA), taking care not to damage the equipment.
- c. Clean the equipment and prepare for turn in.

**3.2.1.14 Control Unit Replacement.**

- a. Apply fastener tape to the unit, if needed.
- b. Mount the CU to the vehicle (for the LAV-25, on the top of the CDA).
- c. Connect the System Cable to the CU.

**3.2.1.15 Power Controller Removal.**

- a. Disconnect the System Cable from the Power Controller.
- b. Detach the Power Controller from the vehicle, taking care not to damage the equipment.
- c. Clean the equipment and prepare for turn in.

**3.2.1.16 Power Controller Replacement.**

- a. Apply fastener tape to the bottom of the Power Controller, if needed.
- b. Attach the Power Controller to the fastener tape on the vehicle.
- c. Connect the System Cable to the Power Controller.

**3.2.1.17 Shorting Plug Removal.**

- a. Remove the shorting plug from underneath the gun mount, and loosen the fastener tape patches or tie-wraps loop.
- b. Turn the connector ring on cable W104P2 counterclockwise, and disconnect the shorting plug.

**3.2.1.18 Shorting Plug Replacement.**

- a. Inspect connector assembly for damage.
- b. Replace the shorting plug using the installation procedures in paragraph 2.3.2.10.

**3.2.1.19 System Cable (all System Cables) Removal.**

- a. Disconnect cable from all units and other cables.
- b. Detach the System Cable from the fastener tape patches or tie-wraps securing it to the vehicle.
- c. Remove the cable, taking care not to damage the cable or connectors.
- d. Clean the cable and prepare for turn in.



**3.2.1.20 System Cable (all System Cables) Replacement.**

- a. Replace the cable using the installation instructions applicable to the type of system cable and the type of LAV.
- b. Safely secure cables to the vehicle using fastener tape patches or tie-wraps.

**3.2.1.21 Optical Turret Positioning Device Removal.**

- a. Detach the OTPD from the vehicle, taking care not to damage the equipment.
- b. Remove battery and secure battery door.

**CAUTION**

Ensure battery door is securely closed during storage and operations, or damage can occur to the battery door.

- c. Clean the equipment and prepare for turn in.

**3.2.1.22 Optical Turret Positioning Device Replacement.**

- a. Apply fastener tape to the bottom of the OTPD, if needed.
- b. Install 9-volt battery and secure battery door.
- c. Position the OTPD so the IR transmitter window points to the front of the vehicle and turret.
- d. Run BIT to verify correct positioning of OTPD, reposition if necessary. (Refer to paragraph 2.3.2.11.)
- e. Attach the OTPD to the vehicle.

**3.3 DISASSEMBLY PROCEDURES FOR ALL LAV CONFIGURATIONS.**

- a. Disconnect and remove the System Cable(s) and all MILES 2000 equipment in accordance with the removal procedures in Section 3.2.
- b. Remove batteries from applicable equipment.
- c. Clean and inspect equipment. If there is any damage to the equipment, report damage on the appropriate form (a separate form for each piece of equipment) and turn in with damaged equipment.
- d. Place equipment and System Cable(s) in the transit case.

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